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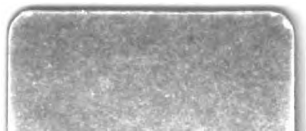
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THE
GARDENER'S DICTIONARY;
CONTAINING
THE BEST AND NEWEST METHODS
OF
CULTIVATING AND IMPROVING
THE
Kitchen, Fruit, and Flower Garden, and Nursery;
AS ALSO, FOR PERFORMING THE
PRACTICAL PARTS OF AGRICULTURE;

Including the managing of Vineyards; with the methods of making and preserving Wines, according to the practice of the most skilful Vignerons in the several wine Countries in Europe; together with directions for Propagating and Improving, from real Practice and Experience,

ALL SORTS OF TIMBER TREES.

THE NINTH EDITION.

REVISED AND ALTERED ACCORDING TO THE LATEST SYSTEM OF BOTANY.

By PHILIP MILLER, F.R.S.

Formerly Gardener to the Worshipful Company of Apothecaries, at their Botanic Garden in Chelsea, and Member of the Botanic Academy at Florence.

Being a copy of the latest Edition of this Work which has been Published in the Life-time of the Author, and modified according to the latest discoveries in the Science in all its branches, which forms the subject of the Dictionary.

..... Digna monet divini gloria ruris.—VIRG. GEORG.

IN FOUR VOLUMES.

VOL. I.

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THE GARDENER'S DICTIONARY,

&c. &c. &c.

ABI

ABELE TREE. See *Populus*.

ABELMOSCHUS. See *Hibiscus*.

ABIES (the Fir), a genus of trees of the coniferous tribe, well-known for the valuable timber that is produced by many of the species. It was formerly considered a part of the genus *Pinus* itself; but modern botanists have followed the popular practice, and have distinguished it. The origin of the Latin name is unknown; that of the English appellation is the Saxon *furh-wudu*, fir-wood.

Class 21, 8. Monœcia Monadelphia, Nat. Ord. *Coniferæ*.

The characters are—flowers *monœci-ous*. **MALES.**—Catkins *simple, solitary, terminal, or axillary. Stamens obtuse, and often callous at the apex, terminated by a jagged membrane; joined in form of a column at their base; separate above.* **FEMALES.**—Catkins *somewhat cylindrical; their scales two-flowered, imbricated, and having frequently at their base externally a bractea, which is either very short or lengthened beyond the scales themselves, and terminated by a taper point. Cones more or less cylindrical; the scales imbricated and woody, but not thickened at the extremity; seeds ending in a membranous wing.*

Vol. I.

ABI

Trees of various sizes, usually with a straight, conical, undivided trunk, from which proceed spreading, horizontal, or drooping branches, arranged in a pyramidal manner; leaves either solitary, or collected in little fascicles, deciduous or evergreen.

From *Pinus*, or the pine tree, the fir is obviously distinguished by its more pyramidal form, and by its leaves arising singly from around the stem, not by two, or three, or a greater number, from out of a membranous shrivelling sheath, as well as by the characters in the fructification above described. Its species form four very natural tribes, of the first of which, the *silver fir* may be taken as the representative; of the second, the *Norway spruce*; of the third, the *larch*; and of the fourth, the *cedar of Lebanon*. Most of these are interesting either for the excellence of their wood or as objects of ornament.

SECT. I. Leaves growing singly round the branches, and all turned towards one side.

SILVERS.—1. **ABIES PICEA** (the silver fir), *Pinus Picea*, Lin., sp. pl., 1420. Leaves solitary, arranged like the teeth

B

of a comb, flat, emarginate, pectinate, of a whitish colour underneath. Cones erect, with very blunt closely-pressed scales, shorter than the taper-pointed inflexed bractæ.

The silver fir displays a more stable and majestic form than any other of the firs; and is readily known by its leaves having their points all turned towards the sky. The branches are not very numerous, and the bark is smooth and delicate. The upper surface of the leaves is of a fine vivid green, and their under surface has two white lines running lengthwise on each side of the midrip, giving the leaves that silvery look which has given rise to the name. The cones are large, and grow erect, of a greenish-purple colour, bristling with reflexed taper points of the bractæ that subtend the scales, and when warm weather comes on they soon shed their seeds. Planks of indifferent quality, on account of their softness, are sawn from its trunk, which also yields Burgundy pitch and Strasburgh turpentine. Duhamel observes, that the silver fir pours out turpentine so freely, that it is seldom necessary to make incisions through the bark for that purpose. For its successful cultivation in this country it requires strong land, such as will suit the oak, and a sheltered situation; it will then become a very large tree. Its trunk sometimes arrives at one hundred and fifty feet in height, and six feet in diameter. It is said to grow slowly for the first fifteen years, but afterwards with great rapidity. In Ireland it has been observed, that no tree attains to so large a size so speedily as the silver fir; some at forty years growth (in a wet clay on a rock), measuring twelve feet in circumference at the ground, and eight feet at five feet high; containing seventy-six feet of solid timber. From a communication to Mr. Lambert, it appears that trees have been felled, which, at one hundred years of age, contained six loads, or two hundred and forty cubic feet of timber. A plant in Woburn Park is recorded to have grown for one hundred and ten years at the rate of one foot in height, and nearly three and a half cubic feet per annum. A native of the mountains of the middle and south of Europe, in stony, dry, exposed situations. Its favourite district seems to be on the Pollino, and in the forest of Rubia, in the kingdom of Naples, where

it is found in all its grandeur, often growing from one hundred and thirty to one hundred and fifty feet in height, and richly meriting the name *pulcherrima* (most beautiful), applied to it by Virgil. In 1739, it was cultivated in Chelsea Garden; but, as thirty-six fine trees are mentioned by Plot and Ray as growing near Newport, in Shropshire, it must have been here much sooner. It is the *sapin* of the French.

2. *ABIES SIBIRICA* (the Siberian silver fir), *Pinus Sibirica* and *Pinus Pichta* of the gardens.—Scarcely anything certain has been published of this tree, which, according to Linnaeus, Mr. Lambert, and others, is the same as the *Abies Picea*, but which Russian botanists have distinguished as a particular species. Gmelin describes it as a native of all parts of Siberia, as far as 58 degs. north lat. in mountainous regions, especially in the upper country lying between the Irtysh and the Ob, where it forms dense woods. The Russians call it *pichta* or *fir*.

3. *ABIES GRANDIS* (Great Californian fir), *Pinus grandis*, Douglas and Lambert. Leaves long, narrow, very blunt, whitish beneath, all turned one way. Cones oblong, erect, rather curved, with very broad, uneven, downy scales, which are longer than the bractæ.—Found, by Mr. Douglas, in low, moist valleys, in Northern California, where it attains the height of two hundred feet. The wood is soft, white, and of inferior quality. Cones from three to four inches long; bractæ very short, jagged, two-lobed, with a short intermediate point.

4. *ABIES BALSAMEA* (the Balm of Gilead fir), *Pinus Balsamea*, Lambert, t. 41. Leaves flat, silvery white beneath, either emarginate or entire at the point, all curved towards the upper side. Cones cylindrical, oblong, erect, with rounded, even, undivided, short-pointed scales.—Found, in the coldest parts of North America, but always in detached individuals, never in large masses. It extends also along the ridge of the Alleghanies, as far as the crests of the mountains of North Carolina. It forms a small, slender, but elegant tree, rarely more than forty feet high, with a diameter of from twelve to fifteen inches. The cones are four or five inches long, and about an inch in diameter; of a most beautiful glossy deep purple colour, inclining to black; and there exudes from them great quantities of a

transparent resin, which has a very rich appearance. The buds and leaves are remarkably fragrant, and during the summer send out a pleasing terebinthinate odour. Its wood is light, of a pale yellow colour, and slightly resinous; but of little value, and is chiefly split up into staves for fish barrels. The English name has been given in consequence of a resemblance between the clear, transparent greenish-yellow turpentine, which is obtained from numerous cysts in its bark, and the balm of Gilead of the shops; it is commonly known under the name of *Canadian balsam*. The Indians use the balsam to fresh wounds; it seems to have the same virtue as the balsam copaiba. The dose is generally from twenty-five to forty-five drops.

In England this is a tree of ornamental appearance when young, on the skirts of plantations, but it rarely acquires any considerable size or height, and scarcely surviving above twenty years, which seems to be about the natural period of its existence. Mr. Lambert remarks, that some of the largest trees of this species are at Woburn Abbey, the seat of the Duke of Bedford, and at Warwick Castle, the seat of the Earl of Warwick, where they are said to be considerably more than twenty years old, contrary to what was supposed both by Miller and others, who have observed that they do not last even so long in many situations. But the finest plants are to be found at Longleat, the seat of the Marquis of Bath. It does not thrive well in the neighbourhood of London, not growing to any large size, and soon decaying after it is removed out of the nursery. It was formerly growing (1696), in the Bishop of London's garden, at Fulham; and of late years a great number of the trees have been raised from seeds brought from Virginia, where it is indigenous.

5. *ABIES FRASERI* (the double balsam fir), *Pinus Fraseri*, Lambert, vol i., t. 42. Leaves solitary, linear, emarginate, silvery-white beneath. Cones oblong, squarrose. Bractæ somewhat leafy, inversely cordate, mucronate, reflexed.—Found, on the high mountains of Carolina, by the late Mr. Fraser, by whom it was introduced into England. Mr. Pursh also met with the species on the Broad Mountains, Pennsylvania. According to Mr. Lambert, it is little more than a shrub, seldom exceeding ten feet

in height, and more frequently (at least in this country), much less. That botanist considers it well suited for lawns and pleasure-grounds, in situations where it is wanted to break particular lines, but not to interrupt the view. A fine specimen exists in the nursery of Mr. Lee, at Hammersmith.

6. *ABIES NOBILIS* (large-bracted fir), *Pinus nobilis*, Douglas and Lambert. Leaves very numerous, falcate, all turned one way, of nearly the same colour on both sides. Cones oblong, erect, with rounded broad scales concealed by the long wedge-shaped two-lobed jagged scales, which are bent back, and terminate abruptly in a rigid elongated point.—A majestic tree, forming vast forests upon the mountains of Northern California, where it was found by Mr. Douglas. The timber is said to be of excellent quality. The cones are about six inches long.

7. *ABIES WEBBIANA* (Webb's fir), *Pinus Webbiana*, Lambert, t. 44. Leaves linear, solitary, flat, spreading, and turned one way, silvery-white beneath, with a deep notch at the extremity. Cones oblong, erect, obtuse, with very broad, rounded, even scales.—According to the account of Captain Webb, who first discovered it, this remarkable species attains the height of eighty or ninety feet, with a diameter near the ground of three or four feet. The leaves are about one inch long, of a beautiful bright green, having a white stripe along the centre. The silvery hue of its bark, the beautiful contrast of the leaves with the rich purple of the cone, glittering with globules of transparent resin, produce in combination one of the most striking objects which can well be imagined. Inhabiting the colder regions of Northern India, and found among a flora that is more Siberian in its character than Indian, there can be no reasonable doubt of its being well able to withstand the rigour of the winters of this country. Plants that have been obtained for our gardens, within the last few years, have an air of health and robust strength that promises most favourably for its introduction as a common forest-tree. They are, however, like the Norway spruce, and many others, ill adapted to bear frost after they have once begun to grow. High and dry stations, where the late frosts of spring are little felt, would (it is to be

presumed) be the most eligible for experiments upon its naturalization. The natives call it *oumur*, and extract an indigo or purple pigment from the cones, and use the wood for making planes.

8. *ABIES CANADENSIS* (the hemlock spruce fir), *Pinus Canadensis*, Lambert, t. 45. Leaves flat, arranged irregularly in two rows, when young, downy as well as the young slender branches. Cones small, scarcely longer than the leaves, ovate, sharp pointed, with rather acute, even, entire scales; seeds very small.

This is an elegant tree, rising to the height of seventy or eighty feet, and measuring from two to three feet in diameter. It appears to be of slow growth, not arriving at its full dimensions in less than two hundred years. When from twenty-five to thirty feet high, its form is exceedingly elegant, but when old, its huge limbs are apt to be rent and broken by winds and snow; and their naked stumps sticking out beyond the young and verdant foliage, give the trees an air of decrepitude and decay. The wood is of little value being neither sound nor durable. The bark is exceedingly valuable for tanning; mixed with oak-bark, it is said to be, much better than oak-bark alone. It bears clipping well, and is therefore adapted, like the yew, to the construction of live-fences. A great deal of the *essence of spruce* is extracted from its shoots. The most northerly situation in which this tree is found is about Hudson's Bay, in lat. 51 degs. Near Quebec it forms extensive forests; in Nova Scotia, New Brunswick, Vermont, and the upper part of New Hampshire, it is extremely common; but in the middle and southern states it is confined to the Alleghanies and their dependent ridges, where it inhabits the sides of torrents and the bleakest situations.

9. *ABIES DUMOSA* (the deciduous silver fir), *Pinus dumosa*, Lambert, t. 46. Leaves flat, all turned one way, serrulate towards the points, covered beneath with a milkwhite bloom. Cones terminal, erect, ovate, blunt, very small, with lax, ovate, very blunt scales.—A tree seventy or eighty feet high, with a clear trunk of from fifteen to twenty feet, and a spreading, very branchy head. Leaves about an inch long, falling off at a very early period, and so exceedingly deciduous, that the slightest shake of the branch is sufficient to detach them; very bright

green, and shining. Cone not above an inch long, pale brown, nearly smooth, with several minute scales at its base; the scales ovate and very obtuse, subtended by a short kidney-shaped bractæ; seeds very small. The wood is of bad quality, being liable to warp, on which account it is not much employed. Found in the northern parts of India, in the provinces of Nepal, Bhoton, and Gossaingsthan, one of the lofty peaks of the Himalays, where it is known by the names *tangshing* and *changathasi-dhup*.

10. *ABIES RELIGIOSA* (the sacred Mexican fir), *Pinus Religiosa*, Humboldt and Kunth, Nov. gen. et sp. pl. vol. ii., p. 5.; Lambert, t. 43. Young branches quite smooth. Leaves arranged in two rows, sharp pointed, covered beneath with a glaucous bloom.

It is described as a lofty tree, resembling *Abies Picea* and *Balsamea*, from which it is distinguished by its sharp-pointed leaves. The flowers are unknown. According to Mr. Lambert, the cones are like those of the *Cedar of Lebanon*, but smaller, and almost black, which most probably, in the fresh state, was a deep purple. From specimens brought by Mr. Graham, from Mexico, we should suppose this to be a very beautiful tree; the leaves are longer, and the branches more slender than those of any other of the silver tribe. The branches are used for adorning the churches in Mexico, where it is called *Oyamel*. Found by Humboldt, on the lower hills of Mexico, between Masatlan and Chilpantzingo, at an elevation of four thousand feet. Deppe and Schiede found it upon the cold mountains of Orizaba, at the highest limit of arborescent vegetation.

11. *ABIES HIRTELLA* (the hairy fir), *Pinus hirtella*, Humboldt and Kunth, Nov. gen. et sp. pl. ii., p. 5. Young branches covered with hairs. Leaves arranged in two rows, flat, acute, covered with glaucous bloom beneath.—Known only from the incomplete account of Humboldt, who found it on the mountains of Mexico, near El Guarda, between Guchilaque and the city of Mexico, growing at an elevation of between eight thousand and nine thousand feet. He describes it as a small tree, three or four times as high as a man. Its cones and flowers are wholly unknown. The leaves are about an inch and a quarter long.

12 *ABIES SMITHIANA* (the Indian silver fir), *Pinus Smithiana*, Wallich. Plant. As. rarior., vol. iii., p. 24, t. 246. Leaves slender, four-cornered, whitish beneath, a little turned towards one side. Cones erect, ovate, oblong, with obovate, rounded, even scales.—A tree of enormous size, with nearly opposite branches, covered with short down, and so arranged as to form generally two rows. Leaves dark green, from an inch to an inch and a half in length. Cones from four to six inches long, brown, very even, and covered with a glaucous bloom. Seeds small. A native of the mountains next the Himalayeh, where it is called by the natives *raga*. Nothing more is known of this plant, which is only described in Dr. Wallich's work, above quoted.

SECT. II. Leaves growing singly round the branches, and all spreading equally.

SPRUCES.—1. *ABIES COMMUNIS* (Norway spruce fir), *Pinus Abies*, Lambert, t. 35. Leaves scattered, somewhat four-cornered, mucronate. Cones cylindrical, pendulous, with blunt, wavy, slightly-toothed scales.

The Norway spruce fir is the loftiest of our European trees, attaining from one hundred and twenty-five to one hundred and fifty feet in height, with a very straight trunk, and throwing out its spreading branches so as to form an elegant pyramid, and is readily known by its leaves of one uniform dull-green colour spread equally round the branches, and by its long pendant cones. Though not a native of this island, few trees have been more generally or longer cultivated here. The timber is inferior to that of the common pine in durability and bulk, and being often knotty, is not proportionally strong for horizontal bearings with that timber. White Norway deal, however, is used for a great variety of purposes in building; and the entire trees are more prized than any other for masts for small craft, for spars both for marine purposes and on land. What constitutes the value of this fir is, that its timber is equally durable at any age, like that of the larch; and what renders it peculiarly adapted for masts, spars, scaffolding poles, &c. is its habit, almost in every case, whether standing single or together, of growing perfectly erect and straight. The tree may be cut for rods, stakes, and scythes, or other implement handles, when the trunk at the base is not more than two inches in

diameter, and the bark, being kept on it, it will prove almost as durable as the larch. Pontey says, that poles of spruce are so far inferior to those of larch, that they are more apt to crack when exposed whole to the influence of the sun and air; but in all other respects they are nearly equal to it, and in straightness surpass it. It will not, however, grow in elevated situations, where the common pine and larch will flourish.

No tree will yield greater profit than the spruce fir in cold land—no tree is more beautiful standing single on turf in large plantations, or more useful for shelter in cold soils and situations. When growing singly in a rich soil, separately from other trees, this forms one of the most beautiful objects that can be imagined, with its long drooping branches touching the very ground, and its regular pyramidal figure: and in other situations, the long sweeping fan-like branches, often broken down by loads of snow, or the effect of boisterous winds, are said to have a grand effect in Alpine landscapes, and have been well employed in the sublime compositions of Salvator Rosa, and the German engravers.

In Norway it arrives at maturity in seventy or eighty years. Trees of such an age are what are usually cut down for exportation, and each yields on an average, three pieces of timber, eleven or twelve feet long; if an incision is made into the bark, a clear tenacious fluid issues, which concretes into a resinous substance, known by the name of *Resina Abietis*. This after being boiled in water, and strained through a linen cloth, is called in the Pharmacopias *Burgundy Pitch*.^{*} But if the boiling of the native resin is continued till the water is wholly evaporated, and wine vinegar is at this time added, a substance named *Colophonium* is formed.

Burgundy Pitch, which is chiefly imported from Saxony, is of a solid consistence, yet somewhat soft, of a reddish brown colour, and not disagreeable in smell. It is entirely confined to external use, and was formerly an ingredient in several ointments and plasters. In inveterate coughs, affections of the lungs, and other internal complaints, plasters of this resin, by acting as a topical stimulus, are frequently found of considerable service.

In forests, impenetrable to the rays of the sun, the incisions are usually

made on the south side, but in different situations this is not always the practice; the side most exposed to rain is never subjected to incisions. If only one incision be made in a spruce, there will be a supply of resin from twenty-five to thirty years. A vigorous tree, planted in a good soil, will yield in one year thirty or forty pounds of juice.

The *effluvia* of the Norway spruce are supposed to effect a salubrious impregnation and coolness of the air, on which account it is usual in Sweden to cut the branches into pieces of about half a finger's length, and strew them on the floors of apartments tenanted by invalids. Jonston, in his *Deudrographia*, speaks of the wholesomeness of walking in groves of pines, and Linnæus informs us, that the Laplanders apply the young shoots to the head, for the removal of pains in that part. Fresh cones, boiled in whey, and brewed with pine tops, are accounted good in inveterate scurvies. This species is an excellent shelter for the most valuable game. Linnæus has five varieties in his *Flora Suecica*, but they are insignificant.

In the *Kew Catalogue*, it is said that the Norway spruce was cultivated in Chelsea Gardens in 1739; but it is scarcely credible that it should not have been introduced here before, though we have not at present found any direct evidence for it.

2. *ABIES ORIENTALIS* (the oriental fir), *Pinus orientalis*, Lambert, t. 39. Leaves *very short and dense, uniformly imbricated, quadrangular, with a callous point*. Cones *are small, tapering, ovate, cylindrical, pendulous, their scales somewhat rhomboid*.

This species is known chiefly by a figure published by Mr. Lambert after a drawing by Aubriet, the celebrated draftsman, who accompanied Tournefort in his journey to the Levant. It was found by that traveller on lofty mountains above the convent of St. John, twenty-five miles south-east of Trebisonde. It has been subsequently met with, by Russian botanists, in the woods of Mingrelia, and near Teflis by Sir Gore Ouseley, who sent specimens to Mr. Lambert, which enabled him to speak decidedly as to the specific distinction of this species, although but little has been added to our general information. It appears to be the only one of the spruce tribe that Tournefort found in the Levant.

3. *ABIES ALBA* (the white spruce fir), *Pinus alba*, Lambert, t. 35. Leaves *rather glaucous, spreading equally round the branches, four-corned, somewhat pungent*. Cones *narrow, oval, tapering towards the point, with even, undivided scales*.—Found along with *Abies nigra*, in the colder regions of North America; according to Michaux, it does not advance so far to the northward as that species, from which it is known only by its smaller size, the trunks rarely exceeding forty or fifty feet in height, but also by the bluish cast which characterizes the foliage, and which gives it a much lighter appearance than the sombre *Abies nigra*: Dr. Richardson, however, states "that it was the most northerly tree observed in Franklin's Polar journey. The timber is of inferior quality. From the fibres of the root, macerated in water, the Canadians prepare the thread with which they sew together the birch-bark that forms their canoes. Its resin is also used to render the seams water-tight, and was the only tree that the Esquimaux of the Arctic Sea had access to while growing; and they contrived to make pretty strong bows from it by joining pieces of its wood together."

It vies with *Abies communis* in general form, but not in loftiness; the leaves are smaller, more swelling upwards, and more incurved, and the bark of the trunk whiter. Mr. Lambert strongly recommends the cultivation of this species on a large scale, "because it becomes a tree of considerable magnitude, the timber of which may be advantageously employed, and because situations which are unfavourable to the progress of many other pines, are good for this; it flourishes on poor and rocky land, a soil apparently but just sufficient to hold the roots, enables it to grow." And he observes, "there are many heaths and waste lands in this and in the sister kingdom which might be applied to its cultivation; and as proofs that Hounslow and Bagshot Heaths are not unsuitable," mentions the flourishing plantations of Whitton and its vicinity; Milton Abbey, in Dorsetshire, and the grounds of the Earl of Tankerville, at Walton, are named by Mr. Lambert as stations where fine specimens of this species may be seen. The bark is said to be occasionally used for tanning. Cultivated in England by Bishop Compton, before 1700.

4. *ABIES NIGRA* (the black spruce fir), *Pinus nigra*, Lambert, t. 37. Leaves

spreading equally round the stem, short, four-cornered. Cones *ovate, oblong, obtuse, with ragged rounded scales*.—The trunk is remarkable for the perfect regularity with which it diminishes from the base upwards. The head is of a regularly pyramidal figure, the branches spreading almost horizontally, and not inclining towards the earth, as in the Norway spruce. The cones (hardly above an inch long), are crowded about the sides of the last-year's shoots, which have protruded beyond them, and before they become dry, are of a rich deep purple. In Canada and Nova Scotia, the seed ripens about the end of November, but is not shed before the following spring. The timber is of great value on account of its strength, lightness, and elasticity. It is employed for the yards of ships; and in America, in districts where the oak is scarce, also for their knees, from a portion of the base of the trunk, connected with one of the largest diverging roots; floors are occasionally laid with it, but it is not so well adapted for this usage, as the planks are apt to split. From its young branches is extracted the *essence of spruce*, so well known as a useful antiscorbutic in long voyages.

A native of the most inclement regions of North America, especially in swampy situations, and in the valleys between ridges of low hills, where the soil is deep, black, and humid. In such situations are found the finest forests of this species, and there, although the trees are so crowded together as often not to be more than four or five feet apart, the timber arrives at the height of seventy or eighty feet, with a diameter of from fifteen to twenty inches. The firs in the landscapes of northern scenery, illustrating Captain Franklin's *Polar Expedition*, are of this species, which, however, Dr. Richardson did not observe higher than 65 degs. north lat. This tree is not so much cultivated in this country as it deserves.

5. *ABIES RUBRA* (red spruce fir), Lambert, t. 33. Leaves *solitary, awl-shaped*. Cones *oblong, obtuse*. Scales *rounded, somewhat cloven, the margin entire, the common filament shorter than the bractææ*.—This species is of more humble growth than the *nigra*, which it most resembles, except that the leaves are awl-shaped; the unripe cones of a pale purplish-green, and when ripe rather

oblong than ovate, their scales rounded, and not notched, but split, longer, as well as of a redder colour; which circumstances distinguish *Abies rubra* at once, when it is seen growing along with *Abies nigra*. Michaux, is, however, of opinion that this is only a variety of the *Abies nigra*, and that whatever differences exist, are due exclusively to the influence of soil, and have no dependence upon specific peculiarities. The timber is universally preferred throughout the United States for sail-yards, and, indeed, imported for this purpose into Liverpool from Nova Scotia, where it is also used in constructing casks for salted fish. Found in Nova Scotia and about Hudson's Bay, growing in a most cold soil, seldom attaining a greater height than thirty feet, and flowering in May.

A variety of this tree is cultivated in the gardens near London, called the *Long-coned Cornish Fir*. The leaves are longer, broader, of a lighter colour, and fuller on the branches; the cones also are longer. From the appearance of the old trees, they may be taken for distinct species; but, since both are produced from seeds of the same cone, they are certainly only seminal varieties.

According to Mr. Lambert, the curious dwarf fir, called *Pinus Clanbrassiliana*, the parent tree of which is said to grow on the Earl of Moira's estate, in Ireland, is probably only a variety of this species. There is one of these dwarf trees in Mr. Lee's garden, at Hammersmith.

6. *ABIES DOUGLASHI* (the Douglas Fir), *Pinus taxifolia*, Lambert, t. 43; *Pinus Douglasii*, Lambert, t. 47 and 49. Leaves *spreading equally, deep green, whitish beneath, obtuse*. Cones *ceriseous, ovate-oblong, with rather uneven cartilaginous scales, much shorter than the bractææ, which are three-toothed, the lateral teeth being membranous, with the intermediate ones much longer and more rigid*.—Was first discovered by Mr. Menzies, in the voyage of Captain Vancouver, but the specimens being without cones, it was not until Mr. Douglas had supplied us with these (having found them in the immense forests of North-west America, from 43 degs. to 52 degs. north lat.) that we became acquainted with its essential characters. This is undoubtedly one of the most distinct, as well as the most remarkable, of the group to which it belongs. An ever-

green tree, with an erect, taper trunk, which when old is covered with a rough rugged bark from six to nine inches thick, abounding in a clear yellow resin, and making excellent fuel. The young branches have their bark filled with receptacles of resin, as in the balm of Gilead. The timber is heavy, firm, of as deep a colour as yew, with very few knots, and not in the least liable to warp. The trunks vary from two to ten feet in diameter, and from one hundred to one hundred and eighty feet in height. Occasionally, it arrives at still greater dimensions; there still exists, near Fort George, on the Colombia River, a stump which, without the bark, and at three feet from the ground, measures forty-eight feet in circumference.

(Mr. Lambert saw a plank which, after standing some years in a hot room, was as straight, and its grain as compact, as the first day it was planed). The growth is exceedingly rapid; we have seen a branch three inches in diameter, which was not more than eight years old. The aspect of the young branches is so deep a green, that they seem as if they were more nearly of the nature of a yew than of a spruce. In the autumn, their buds are very prominent and bright brown. The cones are remarkable for the long tridentate bractæ which stick out far beyond the scales themselves.

A considerable number of plants of this important species are now scattered among the parks and woods of this country, some hundreds having been raised and distributed by the Horticultural Society. It appears to suit this climate perfectly, and to be likely to prove more valuable than even the larch itself, being evergreen, and quite as hardy.

7. *ABIES MENZIESII* (Warted-branch-ed Fir), *Pinus Menziesii*, Douglas, Lambert. Leaves very short, rigid, rather sharp-pointed, whitish beneath, spreading regularly round the stem, very deciduous. Cone oblong, composed of very lax, ragged refuse, ovate, thin scales, much longer than the narrow, serrated, concealed bractæ. Buds ovate, acute, covered with resin.—This is one of those remarkable forms which connect the different groups together, possessing the habit and leaves of the silver firs with the cones of the spruces. It is a native

of Northern California, where it was found by Mr. Douglas, who describes the wood as being of excellent quality. The cones, which are about three inches long, are extremely different from those of any other species. The branches, deprived of their leaves, are covered with thin, hard, projecting bases, which give them a singularly tuberculated appearance.

All the species contained in these two sections are increased by seeds; they may also be propagated both by inarching and by cuttings; but it is found that plants so obtained are either very short-lived or stunted, unhealthy, and incapable of becoming vigorous trees. In some of the species such as the balm of Gilead and the silver fir, the scales of the cones readily separate from their axis, so as to render the extraction of the seeds a simple and easy operation; but in others, such as the Norway spruces, the scales will neither separate nor open; in such cases it is necessary to dry the cones as much as possible (but the application of too great a heat will injure or destroy vegetation in them; and the practice of laying the cones on the floor of a malt-kiln, which is said to be used by seedsmen, will in some measure account for the badness of seeds occasionally purchased from wholesale dealers); then to split them by means of an instrument passed up their axis, and afterwards to thresh the portions so separated, till the seeds can be sifted out.

Like other resinous seeds, these are perishable unless sown within a few months after the cones have been gathered; they will, however, keep much longer in the cone than if separated; wherefore, they should always be imported in that state.

It is usual in the nurseries (where the Norway spruce, the silver fir, and the balm of Gilead are annually raised in large quantities in the open ground for the supply of our plantations), to sow them in the spring in beds of light soil, in which no recent manure has been mixed; they are buried at various depths, according to the force of the vital energy of the species. This has been found by experience, as it is said, to be one inch for the silver fir, half an inch for the spruce, and balm of Gilead; and less for the American spruce: it is, however, probable that these depths are of very

little importance. The best time for sowing the seeds of firs, is about the end of March; and, when the seeds are sown, the place should be covered with nets to keep off birds; otherwise, when the plants begin to appear with the husk of the seed on their tops, the birds will pick off the heads of the plants and destroy them. Where the quantity of seeds to be sown is not great, it will be a good way to sow them either in boxes or pots, filled with light loam, which may be removed from one situation to another, according to the season of the year; but, if there is a large quantity of seed, they should be sown on an east or north-east border, where they may be screened from the sun, whose heat is very injurious to the plants at their first appearance above ground. Those seeds which are sown in pots or boxes should also be placed in a shady situation, but not under trees; and, if they are screened from the sun with mats at the time when the plants first come up, it will be a good method of preserving them. In order to protect the surface of the beds from being dried while the young seeds are sprouting, it is generally overspread with a thin layer of long straw, which is removed as soon as the crop begins to appear. Most of the sorts will come up in about six or seven weeks after they are sown; and in very dry seasons, if they are now and then gently refreshed with water, it will forward their growth; but this must be done with great care and caution. During the first season the seedlings should remain undisturbed; the only attention required being to keep them free from weeds; in the following spring the young plants are taken up carefully, and their roots, being a little shortened, are imbedded in rows about six inches apart, where they remain for one or two years. After this they are transplanted into quarters, in rows nine inches or a foot apart, the plants being about six inches from each other. Having remained in this situation for a year, they are fit to be transferred to the plantation; or they may stand two years in the quarters, and then be taken up and replaced in a situation of the same kind, if circumstances should render such a proceeding desirable. On no account, however, should they be allowed to remain in the nursery quarters more than two years at a time without

being taken out of the ground, because they are apt to form long and strong roots, which are destroyed in the process of transplantation, so that the life of many must be either materially injured or wholly sacrificed. The silver fir is exceedingly hardy, and will grow in any soil or situation, but always makes the greatest progress in a good rich loamy earth. Mr. Nicol remarks, that the silver fir grows most luxuriantly in deep loamy earth; but there its wood is soft and spongy. It will thrive on bleak exposures, and on thin gravelly or sandy soil. But that in which we may expect its timber in highest perfection, is a sandy loam, lying on a gravelly sub-soil, or dry rock. On the mountains of Switzerland it grows to a vast size, is excellent timber, and is used for many valuable purposes. As an ornamental tree, it is admissible in all extensive designs, and even on a smaller scale where variety is studied.

The balm of Gilead must be planted in a deep, rich, good earth, as it will not live long in any other sort of soil. It matters little whether it be a black mould, or of a sandy nature, provided it be deep, and there is room for the roots to strike freely. In removing these plants, they should be very carefully raised up with a trowel, so as not to break off the fibres of their roots; nor should they be kept too long out of the ground. During the time they are out, their roots should be covered, to prevent the wind from drying their fibres; and in planting, the earth should be pressed close to their roots, to prevent the air from penetrating to them. As the interruption in the progress of a plant, or the diminution in the vegetable stamina, which may be caused by transplanting, depends more on the degree in which violence is committed on the habits and affections of the root, than on any constitutional repugnance in the plant to removal at a fit season; so it is found, that when a tree is to be nursed to an advanced growth before it is finally planted out, intermediate removals, carefully made at least every alternate year, lessen the inconvenience of the last removal. The root is thereby not only prevented from taking a local wildness of shape, by turning sharply from the obstacles and stretching unequally through the yielding places of the first soil, but it is also kept ready to send out the finest

terminal fibres, to feed immediately upon the soil in which it shall be finally placed.

Marshall observes, that the better the soil is, the faster will the spruce fir grow, though it will thrive very well in most of our English lands. In strong loamy earth it makes a surprising progress; and it delights in fresh lands of all sorts, though ever so poor. On thin soils, and in bleak situations, it grows slowly; and may therefore become the better timber, but on such soils it becomes unsightly. It is difficult to transplant, for the roots extend widely near the surface of the earth; but if it survive one removal, it may afterwards be transplanted freely; for the roots that have been shortened, send out numerous little fibres sufficient for its nourishment. In the new ground, always insert it at the same depth at which it stood before, and let the side which originally faced the south be placed in the same relation.

In respect of timber, it cannot be cultivated in this country with such advantage as the Scotch fir, but as an ornamental tree it surpasses it, where the soil is favourable. There are some majestic spruce firs at Duplin, the seat of Lord Kinnoul, which are supposed to be the largest in the kingdom.

The black, white, and red spruce firs, appear to thrive best in a deep black loam of a middling texture, and which is also subhumid of itself, but does not retain stagnant water. They will also thrive well on sandy or gravelly loams of a moist nature. On dry shallow soils they languish; nor will they thrive on very exposed sites. In deep subhumid valleys are to be found those most stately in this country.

They require full space, otherwise they become very unsightly, even in youth. In America, these trees arrive at great magnitude, and produce that vast store of masts and spars exported thence to Europe; but in this country, the larch excels them in any situation, and for timber, for all purposes, is more valuable.

These firs should not be transplanted at a height exceeding three feet (as, the younger plants are, when set out, the better they will succeed); for, although some sorts will bear transplanting at a much greater age, yet the younger plants will (under similar circumstances)

soon overtake the others, and will eventually far outstrip them. Besides which, the expense of watering and staking, which large plants require, is not needful with smaller ones.

The best season to transplant all the sorts of firs, is about the latter end of March or the beginning of April, just before they begin to shoot; the Scotch pine, however, and some of the more hardy sorts may be transplanted in winter (especially when they are growing in strong land, where they may be taken up with balls of earth to their roots); yet this is what I would not advise for common practice, having frequently seen it attended with bad consequences, but those which are removed in the spring rarely fail.

Where these trees are planted in exposed situations, they should be put pretty close together, that they may shelter each other; and, when they have grown a few years, part of the plants may be cut down to give room for the others to grow; but this must be gradually performed, lest by opening the plantation too much at once, the air should be let in among the remaining trees with too great violence, which will stop their growth.

Wherever large plantations are designed to be made, the best method will be to raise the plants either upon a part of the same land, or as near to the place as possible, and also upon the same sort of soil; a small piece of ground will be sufficient to raise plants enough for many acres; but, as the plants require some care in their first raising, if the neighbouring cottagers (who have many of them small inclosures adjoining to their cottages, or, where this is wanting, a small space be allotted them, for the purpose of raising the plants) are furnished with the seeds, and directions for sowing them, and managing the young plants till they are fit for transplanting, the women and children may be usefully employed in this work; and, the proprietors of land agreeing with them to take their plants when raised at a certain price, it would be a great benefit to the poor; and hereby they would be engaged to have a regard for the plantations when made, and prevent their being destroyed.

No trees are more impatient of pruning than these. They exude, when wounded, so large a quantity of their

resinous sap as to become weakened even by a few incisions; and, if they have suffered many, they are long before they recover from the effects. So great is their symmetry, and so uniformly will their branches form under favourable circumstances, that it will rarely happen that a necessity for the use of the pruning-knife can arise. The great rule to be observed in their management is to allow them ample room for the extension of their branches; if this is attended to, their beauty is not only ensured, but the rate at which they will form their timber will be an ample recompense for the space they may occupy.

The following anatomical description of the fir-tree is from *An Essay on the Operations of the Dry Rot*, by Robert M'Adams, architect and surveyor; 1818.

"The longitudinal divisions of this tree, for it appears to me doubtful whether they can be called *vessels*, are seemingly of two sorts; and, when viewed at right angles to the *radiates*, they appear like a bunch of dressed flax or hemp, after being somewhat pressed, so as to render the fibres a little wrinkled. When viewed parallel to the *radiates*, they have the appearance of a web of the same materials, having four or five threads of the woof close together, as in muslin or cambric, and a space rather more than equal to this without any woof, similar to the space between handkerchiefs in the piece, where the warp only appears without any woof: and thus they are continued in alternate bars one over another, from the extremities of the filaments of the roots to those of the branches.

"The *radiates* lie along that part which looks as if it were woven; and in many cases they have the appearance of vessels of considerable dimensions: but this is only to be seen when they are filled with coloured matter, which is evidently turpentine. Where this is not visible, there is generally something like a very fine dew in miniature on the reticular part, standing in rows both longitudinally and horizontally. The *radiates* apparently perform the same office as in the oak and other trees. The sort of network likewise lies in the horizontal direction, and breaks the rectilinear perpendicular pressure of the juices contained in the longitudinal vessels; if such they be. At all events, it

prevents the juice of the tree from descending in a right line, whether contained in vessels or in the longitudinal cavities between the portions of fibrous matter not connected in a tubular form, yet sufficiently close together to support moisture, on the same principle as that of capillary attraction in tubes.

"If these woven flax-like fibres are hollow tubes, it is probable that they principally contain the more watery matter absorbed by the plant, before chemical union takes place; and they may be presumed to be formed of a film, similar to that which soon appears on the surface of water when poured on tar. Though after the texture of the wood is formed, and the chemical union of the different elements of the tree has taken place, it might be supposed, that the contents of the vessels would be coloured matter; yet they are quite transparent and colourless. Still it is difficult to say, whether the little globules, like dew in miniature, which appear in beautiful rows, are contained in longitudinal vessels, or move along by attachment to the firmly-formed thread, now become woody fibre, in a manner similar to the perspiration on the hairs of animals. These globules, which are considerably tinged with colour, and are, no doubt, the blood of the plant, are pressed along the woody fibres, as from one piece of network or lodgment to another. The other sort of longitudinal vessels, if such they may be called, are very irregular; and appear like a number of the small ones ruptured, and combined into one, being evidently open all round like a net purse. They generally contain considerable quantities of fluid; which is supported by thin and seemingly tough membranes. The *radiates* frequently cross these larger vessels; and the general appearance of the blood in them both, where they pass each other seems to indicate, that they communicate together in their passage. The longitudinal vessels, however, appear to contain a much greater portion of air than the *radiates*. The larger longitudinal vessels are generally from one eighth to three eighths of an inch apart, on the circular line of the plant; and about three of them in the breadth of each concentric ring, or year's growth. In other cases, they are much further apart, but they are extremely irregular. Sometimes three, four, or five, will occur in a

cluster. Where there is such a cluster, the turpentine will generally be found exhaling from the plant by these canals. This, however, is far more common in the silver fir, the Weymouth pine, and some others, than in the Scotch fir.

"The chemical analysis of the woody fibre of this plant in various experiments has yielded such different results, that I think it unnecessary to mention them. I shall, therefore, only take notice of the juices, and the process of their elaboration as they relate to temperature. A low temperature appears most congenial to the fir-tree, although it is to be found in very warm climates. Yet from the nature of its juices it cannot be expected to arrive at great perfection, in a lower degree of north latitude than 53 or 54 degs.; or rather except in a mean temperature that is proportionate to these degrees of latitude, say 45 or 46 degs. of Fahrenheit.

"The *succus proprius* of fir-trees is of a peculiar kind, and known by the general name of *turpentine*, different varieties of which are produced by different species of the fir. It is obtained in considerable quantity by boring holes, or cutting deep notches, in the trunk of the tree; but more expeditiously by means of artificial heat, when it assumes the name of *tar*. To procure this, the wood of the trunk, branches, and roots, is heaped together, covered with turf, and then set on fire, so as to be exposed to a smothering combustion, as in preparing charcoal. A gutter is formed at the bottom, to receive the turpentine, which flows out strongly impregnated with carbon, whence the tar acquires its black colour. In making pitch from tar by inspissation after it has been imported into this country, the first product that distils over is a brown acid water, mixed with a good deal of oil. As the process proceeds, and the heat is increased, the acid diminishes, and the oil increases. According to Aikin, from six hundred gallons of tar, or eighteen or twenty barrels, the product will be about ten barrels of pitch, or twenty-two hundred; one hundred and seventy-six gallons of oil, and about forty gallons of acid. The oil and water, which are distilled over, do not again mix, so that they can be easily separated by decantation.

"Where the temperature, when this tree is planted, is raised above a certain

degree, the equilibrium of the compound is destroyed; and the oil, being the most volatile of any of the vegetable oils, flies off in the shape of vapour. The resinous substance at this time, being much heated, becomes more fluid; and, the air being expanded through the whole exterior texture of the plant, the juice is pressed upward by the same means and force as in other plants. Though the assistance of the leaves is comparatively trifling, their deficiency is supplied by the very expansive quality of the juice; a quality it possesses to such a degree, that in barrelling tar at Archangel, it is found necessary to leave a considerable space in the top of the barrel empty. I have been told as much as four or five inches, in order to meet the expansion of our temperature.

"When by a high temperature the juice of the tree, or rather the oil, is forced off in various ways, as at any amputated branch or wound in the tree, by the buds and leaves, &c., on the return of the evening the resinous matter congeals, and fixes itself in the situation where it happens to be, with a very little decline of the temperature, and becomes almost incapable of being raised any higher by the power of capillary attraction. In consequence of the oily substance being driven off by the heat of the day, and the vessels becoming comparatively empty, they are then compelled to absorb more than an ordinary portion of the circumambient atmosphere, not only to restore the *succus communis* that the tree had perspired in the heat of the day like other plants, but likewise to fill up the space before occupied by the volatile oil of the *succus proprius*.

"Thus the fir-tree, in a warm climate, is not only liable to be deprived of its native juices, by one part, which appears to be about twenty-five per cent. of the whole juice, being driven off in oily vapour, and another rendered thick and pitchy, so that it is incapable of being acted upon any more in the shape of sap; but likewise to be loaded with matter, to fill the space before occupied by the volatile oil now dissipated. This coming in some measure into contact with the resinous substance by the returning heat of another day, extracts from it something like the film that will appear on the surface of water impregnated with resin or pitch; and thus the

native juices are rendered solid and hard. Hence the lower or but ends of fir-trees, the growth of this country, are frequently found as hard and full of resin as if they had been saturated with it in a boiling caldron; while the trunk and the branches have no more than is absolutely necessary to constitute the woody fibres, which become very dry and brittle. When such trees are cut down for purposes of carpentry, they are found very difficult to work. In the first instance, the sawyers experience difficulty in cutting them. They are not only hard, but they clog the saw, filling up the teeth, while a resinous matter adheres to the sides of even the best saws. When, after considerable trouble and expense, they are cut into planks, the same effect is found on the carpenter's tools; the edge, however fine, being very soon clogged up; so that, if the work be small, it is scarcely possible to make fine tools work at all, without a very large portion of hog's lard, or some other grease. This causes the difficulty of working firs of British growth; and is wholly occasioned by the oily part of the juice being driven off: for, if the workmen apply oil of turpentine to their tools, it is found the best for their purpose, though most expensive; and this is the very matter of which the timber is deprived by a high temperature.

"In this country, or perhaps any other of equal temperature, if a great number of fir-trees, or even small clumps of them, be planted together on any plain, for ornament or use, where there is no shelter from one side more than another, they are generally found to thrive best on the north side of the clump. The reason is, that those on the south side shelter them from the direct rays of heat, though the heat or general temperature of the day may be nearly as high on the north as on the south side. A few instances of this fact near London may be mentioned. In the whole of those clumps on Hounslow Heath, where the trees are not destroyed, but grow so as to shelter each other, and in that other clump on the high ground south of the same road, between Egham and Virginia Water; although the trees are all young, there are several feet difference in the height between those on the north and those on the south side of the same clumps.

"Hence it is inferred, that no species of the fir-tree will arrive at such perfection in our country, on account of its high and *rapid* change of temperature, as in the higher latitudes. Yet nature is bountiful in providing for all; as the reverse of this is the case with the oak tree."

SECT. III. Leaves growing in clusters; deciduous.

LARCHES.—By some botanists this section is considered as essentially different from Abies; but the want of any clear, distinctive characters, either in the mode of growth or the organs of fructification, induces us to concur with Linnæus, Jessieu, and Richard, in considering the larch of the same genus as the spruce. The leaves of the former are clustered or fasciculated, merely in consequence of the universal non-development of lateral branches; so that the leaves themselves make their appearance without a perceptible central axis. This is proved not only in the cedar of Lebanon, but even in the larch itself, by numerous cases where the branches being less abortive than usual, lengthen enough to display their real nature.

1. ABIES LARIX (the common larch fir), *Pinus larix*, Linn. sp. pl. 1427. Leaves clustered, deciduous. Cones ovate-oblong blunt, the margins of their scales reflexed, jagged.—A native of the mountains of the middle of Europe, of Russia, and of Siberia. In this latter country it is the commonest of all trees, delighting in dry elevated situations, where it forms vast forests, sparingly intermixed with pines. Its trunk grows very erect, with graceful drooping branches, gradually diminishing from the base to the apex, and giving it a regularly pyramidal form. In the spring, when its young leaves have just burst into life, it has a peculiar bright yellowish-green tint, which is possessed by no other tree of our forests.

The branches are slender, and their ends generally hang downwards, they are adorned with long narrow, soft leaves, which spring in tufts from a point, and spread open like the hairs of a painter's brush. Their colour is light green, and they are deciduous. The Cones are about one inch in length, obtuse at their apex, where they generally assume a purplish colour, and have imbricated scales smooth on their surfaces, but of a lacerated appearance on the edges.

The leaves fall off in autumn; in which circumstance this and the following differ from all the other species of this genus. In the month of April the male flowers appear, disposed in form of small cones; the female flowers are collected into egg-shaped obtuse cones, which in some have bright purple tops; but in others they are white: this difference is accidental, for seeds taken from either will produce plants of both sorts; the cones are about an inch long, and the scales are smooth; under each scale two winged seeds are generally lodged.

It is believed that this species was the *larix* of the ancient Greeks. The origin of the more modern word *larix*, is uncertain, by some it is derived from the Celtic *lar*, fat, in allusion to its unctuous, inflammable resin; by others from the Welsh *llar*, wide spreading: it is however, more likely to have been in some way connected with the word *l'aris*, which appears, from a very curious paper by Mr. Drummond Hay, read some time since to the Horticultural Society, to be the Berber name of a large coniferous tree found in Rif, or Er Rif, and in all the higher sierras of Morocco.

Mr. Miller mentions a variety from China, which he distinguishes as a species under the name of *Larix Chinnensis*, of which he states, "the cones were sent to the Duke of Northumberland, and the seeds, being sown, grew both at Stanwick and in Chelsea garden. The cones were much larger than those of the common sort, and ended in acute points; the scales were prominent like those of the Scotch pine, and had so little resemblance to those of the larch, that every one who saw them, imagined they belonged to a sort of pine, and they were sent over under the name of 'Fir, good to keep up banks.' As the plants made but little progress the first year, they were weak, and casting off their leaves in autumn were supposed to be dead, and thus most of them were lost; but those which escaped, afterwards shot out their branches horizontally, spreading close to the ground, and seemed to be shrubs, which would never rise upright. They are so hardy, as to thrive in the open air without any protection."

Mr. Lambert remarks, "that it is difficult to determine what is meant by the above, all the trees being now dead."

There are two other varieties of this tree; one a native of America, the other

of Siberia: the latter requires a colder climate than England, for the trees are apt to die in summer here, especially if they are planted on a dry soil. The cones of this which have been brought to England, seem to be in general larger than those of the common sort; but there is so little difference between the trees in their characteristic notes that they cannot be distinguished as different species, though in the growth of the trees there is a remarkable difference. Pallas thus distinguishes the European larch from the American. In the latter the branches are more slender, with a bark more inclining to yellow, and the scars more slender and clustered; the leaves are more tender, narrower, more glaucous, and the outer one in each bundle shorter; cones only one third of the size, blunt, with scales scarcely exceeding twelve in number, thinner, more shining, retuse-emarginate; wings of the seed straight, more oblong, narrower, and together with the seed itself of a more diluted gray colour. In the European larch, the bark of the branches is of an ash-coloured gray: the leaves a little wider, bright-green, all nearly equal, commonly more than forty in a bundle: the cones an inch long, with above thirty woody, straited, rounded, entire, scales. Seeds brownish-gray, with subtriangular wings somewhat bent in. In both, the cones are bent upwards on very short peduncles.

No tree is more valuable, or better, deserves our attention in planting, than the larch. It appears from Parkinson's *Paradise*, that it was cultivated here in 1629; it was then, however, as he says, "rare and nursed up but with a few, and those only lovers of rarities." And Evelyn says, "a tree of good stature not long since to be seen about Chelmsford in Essex, sufficiently reproaches our not cultivating so useful a material for many purposes, where lasting and substantial timber is required. We read of beams of no less than one hundred and twenty feet in length, made out of this goodly tree."

The larch is also one of the quickest growing trees in this climate, whereas the slow growth of the oak is almost proverbial. According to Mr. Harte, it grows slowly the first four years; but in twenty years, will exceed a fir-tree both in height and circumference that is double its age.

The Bishop of Llandaff informs us, that from many experiments made by himself, and collected from others, he finds the annual increase in circumference of the larch, at six feet from the ground, to be one inch and a half on an average of several years: and that this inference has been drawn from the actual admeasurement of larches in different parts of England and Scotland, and of different ages from ten years old to fifty.

Evelyn, and almost every writer on timber, since he published his *Silva*, has recommended planting larch, and it is truly surprising with what little effect till lately.

The largest and handsomest larch in this country, is at Strathfieldsay, the seat of the Duke of Wellington. The trunk of this tree is ten feet in circumference, at the height of four feet and a half from the ground, and in proportion quite to the top. Its branches rest on the ground, extending over a space fifty feet in diameter. It was planted about forty years since by Mr. Malcolm, nurseryman, Kensington.

Vitruvius, in his description of the qualities and uses of larch timber, says it is not subject to decay, and resists the worm. He recommends it both for external and internal purposes; for the former, on account of its durability, for the latter purpose, on account of the fineness of its grain, and the ease with which it may be wrought; and attributes the sudden decay of buildings, erected in his time, in a great measure to the want of larch in the neighbourhood of Rome; it having been previously exhausted, and the expense of bringing it from a distance so high as greatly to circumscribe the use of it. Dr. Pallas, in his survey of the Russian dominions in Asia, observed several tumuli at Kamtskatka, reared at a period so remote, that none of the present inhabitants had any tradition respecting their origin. The platform was covered by larch-wood, over which the mound of earth was raised, and the wood was found to be uncorrupted. "I have in my garden," says Mons. le President de la Tour d'Aigues, in the year 1787, "some rails, part of which are oak, and part of them larch-wood; they were made in 1743, and only once painted. The oak has yielded to time, but the larch is still sound. They make casks of it in Provence; the fineness of the

grain retains the spirit of the liquor perfectly, and does not alter its qualities: it has been used for that purpose from time immemorial in the Higher Dauphiné. I have, in my castle of Tour d'Aigues, beams of twenty inches square, which are sound, though upwards of two hundred years old; but trees of this size are now to be found only in places, whence they cannot be transported. There are in some parts of Dauphiné, and in the forests of Baye in Provence, larch trees which two men could not grasp, and about seventy-two feet in height."

The larch must stand to be of a sufficient age before the timber acquire its best qualities of strength and durability.

The acknowledged utility of the larch induced the truly respectable Society for the Encouragement of Arts, Manufactures, and Commerce, at London, to offer very early both honorary and pecuniary rewards for the propagation of this tree; and so long since as the year 1788, three gold medals and a premium of thirty pounds had been bestowed by the Society for planting larch, and giving an account of the utility of the wood. This attention of the Society, and a conviction of the superior qualities of the larch impressed upon the minds of gentlemen in various parts of these kingdoms, have induced them to make some considerable plantations; and we are informed by Mr. Drummond, of Blair Drummond, in Scotland (son to the late Lord Kaims), that by the great plantations of larch, yearly made both in England and Scotland, the value of this excellent tree is now well understood; and, if these plantations are continued for some years with the same spirit, there can be little doubt, that in half a century, the many thousand pounds annually sent to Norway for timber, will be entirely saved to this country.

Mr. Anderson has enumerated the particulars of five hundred and ninety-nine thousand six hundred and twenty-one larches planted in Great Britain between the years 1784 and 1795; and he adds, "the Duke of Atholl alone plants two hundred thousand larches every year; and one nursery-man at Edinburgh has raised this year (1796), above five millions." See also, on this subject, the *Transl. of the Society of Arts* from 1788 to 1811.

In the year 1808, the Duke of Atholl transmitted to the Commissioners of Naval Revision, some "Observations on Larch;" they were inserted in the *Communications to the Board of Agriculture*, vol. vii. and constitute a very interesting document. The larch was introduced into Scotland in the year 1738, by a Highland gentleman. Mr. Menzies, who brought a few small plants from London, some of which were standing in the year 1807, and the largest then measured thirteen feet in circumference.

His grace has been in the constant habit for more than thirty years, of using larch of various ages for different purposes; and he positively affirms that the thinnings of his plantations, employed for paling, rails, and hurdles, "are more durable than oak copse-wood of twenty-four years' growth." He builds all his ferry-boats and fishing-vessels of larch; and after a lapse of years, they have proved sound, when the ribs, which were made of oak, became decayed. In mill-axes, also, larch has been substituted for oak, with the best effect; and, in cutting up an old decayed mill-wheel, those parts of the water cogs which had been repaired with it twenty years before were discovered to be as sound and as fresh as at first. The value of larch is not to be estimated merely by its intrinsic qualities, but also by its aptitude to soils and situations where few other trees can live. On the very summit of the lower range of the Grampian Hills, from a thousand to twelve hundred feet above the level of the sea, on a barren soil composed of mountain-schist, slate, and iron-stone, and where even the Scotch fir cannot rear its head, the larch grows luxuriantly; "and in considerable tracts," says the duke, "where fragments of shivered rocks are strewed so thick that vegetation scarcely meets the eye, the larch puts out as strong and vigorous shoots as are to be found in the valleys below, and in the most sheltered situations." The larch is an alpine tree, and it will not thrive in wet situations; but its comparative value is exceedingly greater than the Scotch fir when it finds a congenial soil. The duke sold a larch that was fifty years old for twelve guineas, while a fir of the same age and in the same situation was not worth more than fifteen shillings.

The largest of the larch trees on the lawn at Dunkeld, was measured in the month of March, 1796, and the following was its dimensions:—At the height of three feet from the ground, the circumference was ten feet; at twenty-four feet from the ground, the circumference was seven feet seven inches; and the whole height eighty-five feet. There were several other larches upwards of one hundred feet in height (which, although five or six years younger), were none of so great a girt.

In twenty-one years after planting, larches have measured from fifty to sixty feet high, and three feet ten inches round the bole. A larch-tree was lately cut down on the Duke of Atholl's estate at Blair, which contained two hundred and fifty-two cubic feet of timber; the age of the tree seventy-nine years. And larch trees of sixty years growth, contain from sixty to seventy cubic feet at a medium. From these facts it would be easy to estimate the value of a plantation of larch at the expiration of sixty years, as there ought to be nearly three hundred trees upon an acre at that period. And in making this estimate, it must be recollected that larch does not require a rich soil, as it thrives best on the sides of hills and in barren and rugged districts, where the land is of little or no value for any other purpose.

The Duke of Atholl has applied larch to a variety of purposes, such as mill-axes, flooring in houses, window-frames, doors, posts, rails, and boat-building; for all of which it has answered so well, that he considers it the greatest acquisition of wood ever introduced into Great Britain. Fishing-boats made of larch under forty years growth, last nearly three times as long as those built of Norway fir.

The durability of larch, when constantly covered with water, is also well known; and it is scarcely necessary to refer on this point to the circumstance related by Witsen (a Dutch writer), that a ship had been found in the Numidian sea, twelve fathoms under water, chiefly built of larch, nor was any part perished, though it had lain above one thousand four hundred years under water, any further than to show that it had been used for ship-timber at an early period. As far as there have been opportunities of trying it, the larch of

this country has not been found inferior in respect to durability. Nothing has a greater tendency to destroy timber than being alternately wet and dry, yet larch is known to have stood the effect of these changes when oak and other timber has failed. A case occurred on the estate of Atholl, where "a weir or river-dam, which, while constructed with oak, required to be renewed or repaired every four or five years; it was afterwards formed with larch, and in 1792, had stood nine or ten years; the timber then remaining in a sound, firm state."

The piles on which the greater part of Venice is built, are said to be of larch; and Scamozzi, who had occasion to use it in considerable quantities, in the numerous buildings which he erected, says "it is very good for floors and roofs; and also for doors, windows, and other kinds of joinery;" and, after having described the nature and uses of the other woods grown in Italy, he concludes with saying, "that the larch is the best and most useful of all woods for the construction of buildings, because it is of a strong nature, and is capable of sustaining great weights. It combines beauty with strength, and is equally fit for carpentry and joinery."

The palettes on which the most distinguished painters have blended their colours, were made of larch. And it was on tables of this wood, that Raphael and other famous artists eternised their skill.

To the other uses of larch-wood, Mr. Harte adds, "that because it is not liable to be warped or attacked by worms, the Italians use it for back-boards, to place behind fine drawings, when they frame them; as also for the frames themselves, as well as the table-frames, &c., because it gives to gilding great force and brightness, and a sort of natural burnishing; and this is the main secret why Italian gilding on wood is so greatly preferable to ours, which has often a tarnished spongy cast, and appears more like gilt gingerbread."

The Italians also prefer it for making the wheels of post-chaises, and other carriages, as being very durable and not apt to crack. No boards make better wainscoting, or take paint better. The application of it to shingles for covering barns and other outhouses

would be invaluable in these kingdoms. Its appearance would be far better than thatch; rains would not rot it, nor winds ruffle it: and if it require any additional recommendation, we may venture to say that it would not harbour sparrows, insects, cobwebs, dust, nor any sort of foulness to which thatch is liable, to the great detriment of the grain; and, although thatch is cheaper at first, larch will nevertheless be found less expensive in the long run.

In Switzerland, where these trees abound, scarcely any other wood is used; they build most of their houses with it; and great part of their furniture is also made of the wood, some of which is white, and some red, but the latter is most esteemed. The redness of the wood is by some supposed to be caused by the age of the trees, and not from any difference of the species, but it is rather owing to the quantity of turpentine contained in them. They frequently cut out the boards into shingles of a foot square, with which they cover their houses, instead of tiles or other covering; these are at first very white, but after they have been two or three years exposed, become as black as charcoal, and all the joints are stopped by the resin, which the sun draws out from the pores of the wood, and being hardened by the air, becomes a smooth shining varnish, which renders the houses so covered impenetrable to either wind or rain.

The shingles in the Grisons are half an inch thick and a foot square; being of a tough nature, and nailed down to the rafters, they are not liable to the inconvenience of being broken by forks, like tiles or slates.

The wood of the larch is well calculated for ship-timber, and would make excellent masts, as it is peculiarly fitted to withstand the effect of sudden gusts of wind; it is preferable to oak for most of the purposes of architecture and engineering. Line-of-battle ships are built with larch, at Archangel, and generally last fifteen years. At Venice it is also sometimes employed in ship-building, especially in the lighter parts of the upper works, but not where massy pieces of timber are required, on account of its weight.

Some very interesting experiments on the qualities of larch-timber are detailed in the *New Monthly Magazine*,
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for May, 1818, from which it appears that larch is superior to oak in stiffness, strength, and lightness, and also in the power of resisting a body in motion (called resilience); and it is inferior to Memel or Riga timber only in stiffness.

Pliny remarks, "It is pretty to consider that those trees, which are so much sought after for *shipping*, should most delight in the highest of *mountains*, as if they fled on purpose from the *sea*, and were afraid to descend into the water."

The thinnings of a plantation of larch may be applied to a variety of useful purposes, whilst they are yet of a small size. In six, eight, or ten years, according to soil and circumstances, the trees will have attained a size sufficient to be made into hay-rakes. They grow so straight, and the wood is so light, strong, and durable, as to be peculiarly calculated for this purpose; and, from its shrinking less than any other wood, these rakes will remain longer firm than those made from any other. About two feet cut off from the root end will form the rake-head; and five feet above that, with a very little taken off from the thickness of the under part will form the handle. No wood is more proper for the teeth of the rake than the red wood of the older trees, because it is not only tough, but little liable either to split or to shrink. Nothing is so fit for shafts to hoes, for it is nearly as strong, and much more durable than ash. Handles for brushes, brooms, scythes, &c., would occasion a vast consumption of these small spars. Light, neat, and yet strong chairs, for rush-bottoms, might be made of larch-wood at this age. Nothing will answer better for hop-poles, for one set of these would outlast two or three sets of ash. Hurdles, spars, and gates may be made of it, both lighter and more durable than of any other wood; and, when the trees are of a size sufficient, they may be split down for cart shafts; and in mining countries they might be employed as posts for supporting the roofs of the mines. The small tops cut off in making these various works, would furnish a neat, elegant, cheap, and durable kind of railing, to be put upon the top of low walls, especially for preventing sheep from over-leaping

them. One end might be let into the coping, whether of sod, clay, or lime; and the other end received into a slip of sawn larch-wood, with holes bored through to receive their points. From the straightness of the wood, this kind of rail would be very neat without much expense. In the same manner hen-coops, crates for packing glass, &c., might be made of this material.

But one of the most extensive and beneficial uses of this kind of small wood, is for the purpose of inclosing. These spars, when the root is thick enough, may be slit up the middle by a saw, and cut into lengths of five or six feet; or, if smaller, they may be employed whole. As they are always straight, and nearly of an uniform thickness, if driven into the ground in rows, at the distance of a few inches from each other, with the split sides all one way, they would make one of the neatest and most complete fences that can be seen. The tops of these uprights might be received into a piece of sawed plank, with holes bored in it for that purpose; and supported at due distances by sloping pieces reaching from the ground to the top.

These are a few of the uses to which the small spars from the first thinnings of the plantations might be applied. As they advance to a larger size, for windows, joists, flooring, paneling, couples, rafters, and every other purpose in building, they would be superior to any other kind of wood hitherto employed. There is not a branch or a twig of the larch, that might not be put to some useful purpose. The larger branches might be employed in fencing, and the smaller brush for filling drains and for fuel. In drains, it is more durable than any other wood; and though the timber will not burn readily, yet the brush is found to make a fire almost equal to the billets of many other trees.

Dr. Anderson has adduced a variety of satisfactory instances and experiments, from which the durability of this wood is established beyond a doubt, even in the early periods of its growth. Nor is this its only good quality, for, when made into planks, there are incontestible proofs of its neither shrinking nor warping, and its having been found unattacked by the worm, during the course of several ages;

it is not yet known whether larch-wood is capable of resisting the sea-worm. Dr. Anderson proposes to ascertain this, by sinking a piece of sound, well-ripened larch-wood, with another piece of sound oak-wood, in the river Medway, at Rochester Bridge, where it is well-known that every other kind of wood is very soon perforated by the sea-worm.

In addition to the other valuable properties of this tree, Mr. White has communicated to the Society of Arts the result of some experiments decisive of the use of its bark in *tanning*. While some of his workmen were taking off the bark from a number of larch-trees, intended for building, they found the nails of their fingers stained, which induced him to try whether it would tan leather or not. He procured two calfskins, of equal price, weight, and substance, and immersed one in an infusion of oak-bark, of very fine quality, and the other in the same proportion of larch-bark, from a very small tree, each skin remaining exactly the same time in its respective tan-pit; and, during the operation, he repeatedly weighed a measure of larch-liquor against the oak, and always found the former to preponderate; the consequence was, that the skin tanned with larch, felt thicker in the hand and heavier, and was finer in the grain, and of a lighter colour, than that tanned with oak. For this communication, Mr. White was presented by the Society of Arts with a gold medal, in the year 1813. (See their *Trans.* vol. xxi. for that year). It is proper also to observe that Mr. White's father had received nine gold and two silver medals from the same Society, for planting those trees, which the son is now converting to so valuable a purpose.

The *resinous juice* of the larch-tree is the *turpentine* of commerce. It issues spontaneously from the bark, but is more commonly obtained by boring a hole with an auger about two feet above the ground, till it reaches near to the heart of the tree; into this hole is inserted a small pipe or cock, through which the turpentine flows into proper vessels placed for its reception. This process is continued from the end of May to the end of September. When the trees will yield no more for that season, the turpentine is pressed through

a cloth to purify it. This is usually thinner than any of the other sorts, of a clear whitish or pale yellowish colour, a hot, pungent, bitterish, disagreeable taste, and a strong smell, without any of the aromatic flavour of the Chian or Cyprus turpentine, obtained from the *Pistacia Terebinthus*. The common and Strasburgh turpentines are from the *Pinus Picea*; but the Canada balsam, which may be considered as the purest of the turpentines, is procured from the balm of Gilead and silver firs.

The turpentine is not to be obtained in considerable quantities from very young trees, and in very old ones it gradually dries up, till at last it affords none; it is only after the tree has attained the thickness of ten or twelve inches in diameter, that it is worth while to collect the turpentine; and from that time, for forty or fifty years, if it continue so long in vigorous growth, the tree will continue to yield annually from seven to eight pounds of turpentine.

All the turpentines totally dissolve in rectified spirit; they become miscible with water into a milky liquor, by the mediation of the yolk or white of an egg, and more elegantly by mucilages. Distilled with water, they yield a subtle penetrating essential oil, vulgarly called *spirit of turpentine*; a yellow or blackish resin remaining in the still which is the common resin of the shops. The essential oil, on being distilled in a retort, becomes more subtle, and in this state is called *ethereal oil of turpentine*.

The turpentines stimulate the first passages, and prove laxative; and we are told by Dr. Cullen, that half an ounce or an ounce of Venice turpentine, triturated with the yolk of an egg, and diffused in water, may be employed in the form of an injection, as the most certain laxative in colics, and other cases of obstinate costiveness. When turpentine is carried into the blood vessels, it stimulates the whole system; hence its use in chronic rheumatism and paralysis. It readily passes off by urine, which it imbues with a peculiar odour; also by perspiration, and probably by exhalation from the lungs; and to these various effects are to be ascribed the virtues it may possess in gravelly complaints, scurvy, and pulmonary disorders. In all these diseases, however, and especially the last, this

medicine, as well as some of the gums and balsams of the terebinthinate kind, by acting as stimulants, are often productive of mischief, as was first observed by Boerhaave, and since by Fothergill.

The essential oil, in which the virtues of turpentine reside, is not only preferred for external use, as a rubefacient, &c., but also internally as a diuretic; and by Pitcairne and Cheyne, as a remedy for the sciatica; but few stomachs are able to bear it in the doses they direct. Turpentine, so much used formerly as a digestive application, is in modern surgery almost wholly exploded.

Besides this well-known product, the larch yields also a manna and a gum. The manna is found in the south of France, and is called the *Manna de Briancon*; it is white, concrete, and sweet, like fine new honey. It is rare, and met with only in small drops, so that it would be very difficult to collect a pound of it. The drops are more or less hard, and adhere to the leaves. Mons. Villars (having made some inquiries relative to this substance) with Mons. Guettard, in the year 1773, found it at sun-rise almost fluid, and picked up drops of it on the turf, exactly like those which remained on the trees; but they have not given any analysis or farther account of it, except that the season of 1773 was less productive of manna than usual. Pallas informs us, that they have this manna in the Russian empire, but that is rarely found concrete, being commonly soon washed off by the rains which are frequent on the Uralian mountains. He remarks also, that the turpentine resides in the bark and the wood next to it, as is apparent when the trunk of a larch is sawed transversely; for then it may be seen that the inner wood for more than half the diameter is dry. It cannot, therefore, be of any use to drive the auger to almost the centre of the tree, as Dr. Anderson recommends.

Pallas mentions a *gum* that is yielded by the larch in particular circumstances. When the woods are on fire, which frequently happens in Russia, the larches are easily burnt on the side next the flame to the height of several feet, on account of the turpentine in which they abound. If the wood happens to be scorched to the pith, the inner part exudes a dry, red-

dish gum, rather less glutinous than gum Arabic, having a slight taste of resin, but wholly soluble in water. It is used in medicine; and the native mountaineers chew it as an antiscorbutic, to fasten their teeth, and as a substance highly nutritive; they also use it as a glue to fasten their bows.

The Siberian hunters of ermines, when the ferment, or yeast, which they carry with them to make the acid liquor they call *quass*, is spoiled by the cold, scrape off the albumen or half-formed wood between the bark and the wood of the larch, which is very juicy and sweet, digest it with water over the fire during an hour, mix it with their rye-meal, bury the dough in the snow, and after twelve hours find the ferment ready prepared in the subsiding fæces.

Old larches produce a fungus, which is described very much at large by Jacquin, in the first volume of his *Miscellanea*, under the name of *Boletus larcis*. It is also called *Agarcis purgans*; and is used in the northern countries as an emetic in intermitting fevers. The Tunguses dye the hair of the rein-deer with this fungus and the roots of gallium of a very deep red colour; whence perhaps it may be of some use in dyeing. The body of this fungus is saponaceous, and is used by the women in some parts of Siberia to wash themselves, and their linen. It was celebrated formerly as a medicine, but is now deservedly fallen into a total disuse.

Bartholinus asserts that "the distilled water of the green cones takes away the wrinkles of the face, dipping cloths therein, and laying them on the skin becomes a cosmetic not to be despised."

It is an unfortunate drawback against so many recommendatory facts, that the larch is sometimes liable to be attacked by a white insect (*coccus Larixæ*), which covers the tree like a hoar frost, and in some situations, threatens the extinction of a plantation and the health of neighbouring trees.

Weak, unhealthy plants, growing in a wet sub-soil, or an excessively shallow barren soil, mere chalk or sand without a mixture of vegetable mould, are first visited and longest infected by it.

It is, however, almost impossible to say too much in favour of this tree. Its timber, whether in the water, or in

contact with the earth, being durable almost beyond conception.

We may safely conclude, with Professor Martyn, that although we should be very cautious how we are carried away by novel ideas and upstart practices, however specious; yet, in the abundant evidence above quoted in favour of this tree, there seems sufficient ground for decision, and that no time ought to be lost in recommending it to the attention of government, and men of property in every district of the island, where barren sandy heaths are found.

2. *ABIES PENDULA* (the black larch fir), *Pinus pendula*, Lambert, t. 49. Leaves clustered, deciduous. Cones oblong, with numerous spreading scales, which gradually diminish from the base to the apex of the cones. Scales of the female catkin, fiddle-shaped, concealed in the full grown cone. Branches weak and drooping.

A native of North America, where it is found growing in a rich clay soil mixed with sand, in cold mountainous districts; and also in low cedar swamps, from Canada to New Jersey; flowering in April and May. Professor Pott observes, "that the trees he has seen growing in Germany are two feet ten inches in the circumference of the stem, and are fifty feet in height; they do not grow so fast as the white larch, but they surpass the *Abies Microcarpa*, and they have besides the advantage of the latter in the very straight growth of their stem, in which they exceed even the white larch. The wood is firm, and likely to be good and useful." When cultivated in this country it is an elegant tree, having a good deal of resemblance to the common larch, but of a brighter green colour, and more graceful. The leading shoot will often begin to droop at the height of fifteen or twenty feet from the ground, and after gradually acquiring an horizontal direction, will bend towards the earth so as to form a natural arch of great beauty.

It was first raised in England, by the celebrated Peter Collinson, whose original tree (one of the treasures of the Mill Hill Garden) was cut down about the year 1800, by its sapient possessor, to make a rail. The abundance of seeds which it annually produced might have been a far more lasting source of profit, as few exotic trees are more wor-

thy of general cultivation. The wood is at least equal to the European larch, and the bark excellent for tanning. The habit and foliage resemble the preceding, but the female catkins are represented by Mr. Lambert, as being of a more crimson hue. The fiddle-shaped pointed lip of each of their scales is four or five times as large as the orbicular one, but never increases after the flowering period; so that it becomes entirely concealed, in the full-grown cones, by the enlarged orbicular lips that constitute the proper scales of the cones, and twice exceed it in length. This circumstance did not escape the excellent Solander, who first described the present species from the tree in Mr. Collinson's garden. The fructification for the most part agrees with the *Pinus larix*, inasmuch that it is difficult to find specific distinctions. The cones, however, are smaller, more cylindrical, with rather fewer scales, whose edges are slightly inflexed; and this, added to the want of the pointed prominences seen in the foregoing, give to the full-grown dark purple cones a peculiar neatness and smoothness of appearance.

It is the *tamarack* or *hackmatack* of the Americans.

3. *ABIES MICROCARPA* (the red larch fir), *Pinus microcarpa*, Lambert, t. 50. Leaves clustered, deciduous. Cones oblong, small; their scales erect, close-pressed, the upper ones much smaller than the lower.

Found about Hudson's Bay, and on the high mountains of New York and Pennsylvania, flowering in May. (Pursh). Michaux, it seems, has confounded this with the last, as did Willdenow in his valuable German work on *Hardy Trees and Shrubs*, published at Berlin, in 1796.

It is a very remarkable species; upon examining the two trees very accurately, I am inclined to suppose them really distinct.

It is similar to *Abies pendula* in general appearance, but the leaves are rather smaller, and the cones considerably so, being rounder and composed of much fewer scales. The male flowers are shorter and more tufted, their anthers scarcely projecting beyond the bractes. The pointed lip of each scale of the female catkin affords the most clear distinction, being elliptical, not fiddle-shaped. The copious crimson cones,

fully grown but not ripe, make a beautiful appearance in summer. Such was the state of a tree of this species, which Mr. Lambert found unprotected in the middle of a pasture, at Whitton, near Hounslow, where it had been planted by John, Duke of Argyle. It had, however, escaped injury, and was immediately secured from further danger. The specimen from which our figure was taken, came from this tree. The cones of this and the *Abies pendula* are sent from America annually, to Mr. Lodiges, one under the name of the black, and the other of the red larch. He has a large plantation of fine healthy trees of each sort about eight feet high, which produce many cones every year, and although they grow close to each other, the cones always remain distinct.

The *larch* is raised from seeds which most years ripen very well in this country. The cones should be gathered about the end of November, and kept in a dry place till the spring, when they should be spread on a cloth and exposed to the sun, or laid before a fire, which will cause the scales of the cone to open and emit their seeds.

These should be sowed in a bed of light earth, covering them about half an inch deep with the same mould. If this bed be netted over to keep off the birds, it will be a sure method of preventing them from destroying the young plants at their first coming out of the ground; at which time they should likewise be screened from the sun in the middle of the day, by covering the beds with mats, because too much sun frequently destroys the plants when they are young. In this bed the plants should remain until the following spring, when there should be a number of beds prepared in the nursery to receive the seedlings. In the beginning of April they should be transplanted into the beds, at the distance of six inches row from row, and in the rows at three inches asunder, setting them in *quinque* order. They should be immediately planted as they are drawn up, because their tender roots are soon dried and spoiled at this season of the year. This work should be done (if possible) in cloudy or rainy weather, and then the plants will draw out with better roots, and will soon put out new fibres again; but, if the weather should prove clear and dry, the plants should be shaded

every day from the sun with mats, and now and then gently refreshed with water. In drawing up the plants, there should be great care taken not to disturb the root of those left in the seed-beds; if the ground be hard, the beds should be well watered some time before the plants are thinned, to soften and loosen the earth; and if, after the plants are drawn out, the beds are again gently watered to settle the earth to the roots of the remaining plants, it will be of great service to them; but it must be done with great care, so as not to wash out their roots, or lay down the plants.

In these beds the plants may remain till the spring twelvemonth after, by which time they will be fit to transplant, where they are to continue. When the young trees are planted out for good, they need not be more than eight or ten feet distant from each other, always planting them closer in exposed situations, than where they are more defended; after planting, they will require no other care than to keep them clean from weeds for three or four years, till the trees have obtained strength, when they will over-top the weeds and prevent their growth; but the ground between these trees should not be dug, for that has been found greatly to stop their growth.

The Siberian larch is of slow growth in this country, for when the spring is mild, the trees will begin to shoot in February, or early in March, and if (as is often the case), a sharp frost succeed, these shoots are often killed, and the growth of the trees stopped.

This species is a very proper tree for cold, moist, peat land, where it will thrive, and in such situations few other trees will grow.

The American larch thrives pretty well upon moist land, but on dry ground will make but little progress. A few of these trees (by way of variety, may be allowed to have place in every collection of trees designed for pleasure; but for profit, the common larch is to be preferred to any other species.

Mr. Marshall, in his work on planting, has observed, "that of the common larch there are several varieties; and that the flowers which the commonest sort exhibits early in the spring, are of a delicate red colour; another sort produces white flowers at the same season, and these have a delightful effect

among those of the red sort; whilst another, called the Black Newfoundland larch, increases the variety, though by an aspect little differing from the others. There are also larches with greenish flowers, pale red, &c. all of which are accidental varieties from seeds. These varieties are easily distinguished, even when out of blow: the young shoots of the white flowering larch are of the lightest green, and the cones, when ripe, are nearly white. The red-flowering larch has its shoots of a reddish cast, and the cones are of a brown colour, whilst the cones and shoots of the black Newfoundland larch are in the same manner proportionally tinged.

The cones, which are a very great ornament to several sorts of the pines, are very little to these. Their chief beauty consists in the manner of their growth, the nature and beauty of their penciled leaves, and fair flowers; for the cones that succeed them are small, of a whitish, a reddish, or a blackish brown colour, and make no figure.

It is stated by the same writer, that the larch tree will grow extremely well on almost any soil; as well in clays as in other sorts; it thrives amazingly on the declivities of hills and sides of high mountains; it is hardy enough to resist the severest cold, therefore proper for all exposed places; and, as the timber is so valuable, and its growth so quick, it is a tree which may be propagated to the great advantage of the owner.

It grows on the barrenest soils and in the bleakest situations. In rich genial sites it luxuriates too much, grows top-heavy, and either loses its head, or is bowed down into an unsightly form, and becomes unprofitable.

Mr. Nichol, however observes, in his *Treatise on Planting*, that, "which soil soever in this country, when in a state of full maturity, this noble tree may most affect, remains yet to be known. If we may judge from appearances, we should decide, that it will be found in the highest perfection of timber in the lighter more gravelly soils, and in elevated situations."

Wherever large plantations of these trees are designed to be made, the best method will be to raise the plants either upon a part of the same land, or as near to the place as possible, and also upon the same sort of soil. A small piece of ground will be suffi-

cient to raise plants enough for many acres. The larch is capable of thriving upon the most barren sands, where scarcely any thing else except heath and furze will grow. They may in many situations be extensively planted; as there are many thousand acres of such lands which at present are of little benefit to any body, that might, by plantations of these trees, become of great value to their proprietors, and also a national benefit. It is in general the expense of making such plantations, that chiefly operates against such undertakings; though, when properly managed, it is much less than is commonly supposed, as the greatest of the expense is that of fencing them from the cattle, &c. for the other is trifling, as there will be no necessity of preparing the ground to receive the plants; and the charge of planting an acre of land will not be more than thirty shillings, where labour is dear, exclusive of the plants, which may be valued at forty shillings more. Many thousand acres of land have been planted with these trees, which were covered with heath and furze, merely by digging holes to put in the plants, and afterwards laying the heath or furze, which was upon the surface of the ground, about their roots, to prevent the ground drying, few of which have failed, the plants being mostly four years old from the seed. In five or six years they have grown so well as to overpower the heath and furze and destroy it, without their having any further culture.

In regard to the distance at which they are generally planted, in all large open situations, it is about four feet, but always irregular, avoiding planting in rows as much as possible; and in performing the work, great care is necessary not to take up the plants faster than they can be planted out, some men employed in digging up the plants, while others are planting. Those who take up the plants should be looked after, to see that they do not tear off their roots, or wound their bark; and as fast as they are taken up, their roots should be covered, to prevent their drying, and put into their proper situations as soon as possible.

In planting them, the greatest care should be taken to make the holes large enough for the roots, as also to

loosen and break the clods of earth, and put the finest immediately about their roots, and to settle the earth gently with the foot to the roots of the plants. Where these circumstances are duly attended to, and a proper season chosen for performing it, there will be very little hazard of their succeeding; but where plantations are made with plants which are brought from a great distance, and which have been so closely packed up as to heat, and cause the leaves to become yellow, few of them will grow in a perfect manner.

In general, after the plantations are made, the only care they require, for four, five, or six years, is to secure the plants from cattle, hares, and rabbits; for if these are admitted to them, they make great destruction in a short time: as where the branches are gnawed by hares or rabbits, it greatly retards the growth of the plants, if it does not wholly destroy them. In about this length of time after planting, the branches of the young trees meet, and begin to interfere with each other; therefore they require a proper thinning out. Some, however, advise pruning off the lower branches, but this must be done with great caution. The lower tier of branches only should be cut off; this should be performed in September, at which time there will be no danger of the wounds bleeding too much; and the turpentine will harden over the wounds as the season grows cold, and prevent the wet from penetrating them. These branches should be cut off close to the stems of the plants, and care be taken not to break any of the remaining branches of the young trees. This work should be repeated every other year, at each time taking off only the lower tier of branches; for if the plants are much trimmed, it will greatly retard their growth, as it does in general that of all trees; but as these trees never put out any shoots where they are pruned, so they suffer more from amputation than those which do. It is probably the best practice, in all cases, to thin out the trees so as to let them have sufficient room and air, as they can never be pruned in the branches without great injury; and in about twelve or fourteen years, they will require more thinning, where the plants have made good progress; but this should be gradually

performed, beginning in the middle of the plantation first, leaving the outside close, to screen those within from the cold, and by degrees coming to them, when those which were first thinned will have had time to get strength, and not be in danger of suffering from the admission of cold air. When these plantations are thinned, the trees should not be dug up, but their stems cut off close to the ground; as their roots never shoot again but decay in the earth, so there can be no harm in leaving them, and the roots of the remaining plants are not injured. The trees which are now cut off will be fit for many purposes; those which are straight will make good putlocks for the bricklayers, and serve for scaffolding poles; so that there may be as much made by the sale of these as will defray the whole expense of the planting, and probably interest for the money first laid out for the whole, and as the upright growth of these trees renders their wood more valuable, they should be left pretty close together, in order to draw each other up, and grow tall. The naked stems of the trees sometimes rise more than twenty feet in height, and as straight as possible; and as many boards have been sawn from one, as laid the floor of a room nearly twenty feet square. If these trees are left eight feet asunder each way, it will be sufficient room for their growth; therefore, if at first thinning, a fourth part of the trees be taken away, the others may stand twelve or fourteen years longer, by which time they will be of a size for making ladders and standards for scaffolding, and many other purposes; so that from this sale as much may be made, as not only to pay the remaining part of the expense of planting, if any should be wanting in the first, but rent for the land with interest; and the standing trees for fortunes for younger children or other purposes.

Those designed principally for ornament should be disposed at such distances as that their branches may extend freely every way, as the beautiful display of the head is a great merit in these trees in such plantations.

Sang (a forest manager of extensive practice, who has paid great attention to the cultivation of this tree), says, "It bears the ascendancy over the Scotch pine in the following important circum-

stances: that it brings double the price at least, per measurable foot; that it will arrive at a useful timber size in one half, or a third part of the time, in general, which the pine requires; and, above all, that the timber of the larch, at thirty or forty years old, when it is planted in a soil and climate adapted to the production of perfect timber, is in every respect superior in quality to that of the pine at one hundred years old. In short, it is probable that the larch will supersede the Scotch pine in most situations in this island at no very distant period."

The objection formerly to the timber of the larch was its liability to warp and twist; but this Monteath and others have proved may be effectually prevented by barking the trees in spring while growing, and not cutting them down till the following autumn, or even for a year afterwards. This is also said to prevent the timber from being attacked by the dry rot.

Like other trees, and especially the resinous tribe, the timber of the larch is much affected by climate and soil. A certain elevation of surface, coldness of climate, and inferiority of soil, is absolutely necessary to produce the timber in proportion. Sang has known it in many places make the most rapid progress for thirty or thirty-five years, and though there was no external signs of disorder, yet when it was felled, the wood had begun to rot in the hearts of the trees, and some were quite hollow a good way up.

SECT. IV. Leaves growing in clusters; evergreens.

CEDARS.—1. *ABIES CEDRUS* (the cedar of Lebanon fir), *Pinus Cedrus*, Lambert, t. 51. Leaves clustered, evergreen. Cones oblong, very obtuse, erect, with broad closely packed scales, which are a little thickened at the margin.

This is too remarkable a tree to be mistaken or confounded with other species, having a general striking character of growth, peculiar to itself.

Mount Lebanon and the range of Taurus are the native spots of this most stately and magnificent tree, which compensates for its want of height by its huge wide-spreading arms, each of which is almost a tree in itself.

"The sturdy arms," says Evelyn, "grow in time so weighty, as often to

bend the very stem and main shaft. The leaves much resemble those of the larch, but are somewhat longer and closer set, erect, and perpetually green, while those of the larch are not; but, hanging down, dropping off, and deserting the trees in winter. The cones are tacked and ranged between the branch-leaves, in such order, that nothing appears more curious and artificial, and at a little distance are exceedingly beautiful. These cones have the bases rounder, shorter, or rather thicker, and with blunter points, the whole circumzoned, as it were, with pretty broad thick scales, which adhere together in exact series to the very summit, where they are somewhat smaller, but the entire lorication smoother couched than those of the firs; within these repositories, under the scales, nestle the small nutting seeds, of a pear shape."

These cones grow upon the upper part of the branches, and stand erect, having a strong woody central style, by which they are firmly annexed to the branch, so as with difficulty to be taken off; which central style remains upon the branch after the cone is fallen to pieces, for it never drops off whole as those of the pine do.

Many wonderful properties are ascribed to the wood of this celebrated tree, such as its resisting putrefaction, destroying noxious insects, continuing a thousand or two thousand years sound, yielding an oil famous for preserving books and writings, purifying the air by its effluvia, inspiring worshippers with solemn awe, when used in wainscoting churches or chapels, &c. With the ancient Romans, the expression "*CEDRO DIGNUS*," was considered as one of the highest compliments that could be bestowed on a literary performance.

Touching the diuturnity of this material, says Mr. Evelyn, "it is recorded by Pliny, that in the temple of Apollo Utica, there was found timber of two thousand years old; and at Sagunti in Spain, a beam in an oratory consecrated to Diana, which was brought to Zante, two centuries before the destruction of Troy: that Sesostrius built a vessel of cedar of two hundred and eighty cubits, and the statue of the goddess, in the famous Ephesian temple, was said to be of this material, as was most of the timber work of that wonderful structure."

Cortes is said to have erected a palace at Mexico, in which were seven thousand beams of cedar, most of them one hundred and twenty feet long, and twelve in circumference, as we are informed by Herrera. Some tell us of a cedar, felled in Cyprus, one hundred and thirty feet long and eighteen in diameter: it was used for the main-mast in the galley of King Demetrius.

In the relation of the properties assigned to this tree, much confusion has arisen by confounding the cedar of Lebanon with other trees called cedars; and as to the materials used in the heathen temples, it is very uncertain what they were. But we have better authority than that of Pliny, that this was the species of timber employed in building the sumptuous temple and palace of Solomon at Jerusalem. "Now, therefore, command thou," said Solomon to Hiram, 'that they hew me cedar-trees out of Lebanon.' 'I will do all thy desire,' replied Hiram, 'concerning timber of cedar and concerning timber of fir.' And Solomon raised a levy of thirty thousand men out of all Israel, and he sent them to Lebanon, ten thousand a month by courses; and he had threescore and ten thousand that bare burdens, and fourscore thousand hewers in the mountains. And he covered the temple with beams and boards of cedar. And he built chambers against it, which rested on the house with timber of cedar, and the cedar of the house within was carved with knots and open flowers: all was cedar, there was no stone seen, and he built the inner court with three rows of hewed stone, and a row of cedar beams. Solomon's house also, of the forest of Lebanon, was covered with cedar upon the beams; and the porch of judgment was covered with cedar from one side of the floor to the other. And the great court of his palace was with three rows of hewed stones, and a row of cedar beams." 1 *Kings*, v. vi. vii.

The allusion of the Psalmist, of spreading abroad like a cedar in Lebanon, shows that he was well acquainted with this tree, which is remarkable for the wide spread of its branches, rather than for its height. Had Milton known it as well, he would not, in speaking of the cedar, have used the expression of the "Insuperable height of loftiest shade." It is not only found on Mount Lebanon, or Libanus, but Belon ob-

served it on the mountains Amanus and Taurus.

Solomon's fourscore thousand hewers must have considerably thinned the forest of Libanus. Few now remain there. Rauwolf, in 1575, saw only twenty-four sound trees, and two old decayed ones. "We found ourselves," says he, "upon the highest point of the mountain, and saw nothing higher, but only a small hill before us, all covered over with snow, at the bottom whereof the high cedar trees were standing. And, though this hill hath in former ages been quite covered over with cedars, yet they are since so decreased, that I could tell no more but twenty-four that stood round about in a circle, and two others, the branches whereof are quite decayed for age. I also went about in this place to look out for some young ones, but could find none at all. These trees are green all the year long, have strong stems that are several fathoms about, and are as high as our fir trees."—*Travels*, part ii. ch. 12.

Maundrell, in 1696, could reckon only sixteen large trees, but many small ones. His account is as follows. "Having gone for three hours across the plain of Tripoli, I arrived at the foot of Libanus, and from thence continually ascending, not without great fatigue, came in four hours and a half to a small village called Eden, and in two hours and a half more to the cedars. These noble trees grow amongst the snow near the highest part of Libanus, and are remarkable as well for their old age and largeness, as for those frequent allusions made to them in the word of God. Here are some of them very old, and of a prodigious bulk; and others younger, of a smaller size. Of the former I could reckon up only sixteen, and the latter are very numerous. I measured one of the largest, and found it twelve yards six inches in girth, and yet sound, and thirty-seven yards in the spread of its boughs. At about five or six yards from the ground, it was divided into five limbs, each of which was equal to a great tree."—*Journey from Aleppo to Jerusalem*.

"What Maundrell has related," says Mr. Miller, "was confirmed to me by a worthy gentleman of my acquaintance, who was there in the year 1720, with this difference only, that, in measuring the branches of the largest tree, he found them to be twenty-two yards in the

spread." Supposing these two gentlemen to have measured the same tree, and not to be mistaken in their admeasurement, this difference can only be reconciled by supposing that the latter meant the spread of the boughs from the trunk, the former the whole spread or diameter, which we may conceive to have increased in twenty-four years. The traveller, Le Bruyn, reckons about thirty-five or thirty-six trees remaining on Mount Libanus when he was there.

Mr. Buckingham, the celebrated oriental traveller, who visited this spot, April 26, 1816, observes thus, "leaving Bisherry on our right, we ascended for an hour over light snow, until we came to the Arz-el-Libeneiu, or the cedars of Lebanon. These trees form a little grove by themselves, as if planted by art, and are seated in a hollow, amid rocky eminences all around them, at the foot of the ridge which forms the highest peak of Lebanon. There are, I should think, at present, about two hundred in number, all fresh and green. They look, on approaching them, like a grove of firs, but, on coming nearer, are found to be in general much larger, though the foliage still keeps its resemblance. There are twenty that are very large, and amongst them several from ten to twelve feet in diameter at the trunk, with branches of a corresponding size, each of them like large trees, extending outward from the parent stock, and overshadowing a considerable space of ground;" and this on the very site where, in the days of Solomon, there was such immense forests of these beautiful trees!—on the very spot where it might be, without poetical exaggeration, said,

See lofty *Libanus* his head advance,
See nodding forests on the mountains dance.

POPE.

The few cedars still remaining on Mount Libanus are preserved with a religious strictness. On the day of the Transfiguration, the Patriarch repairs in procession to these trees, and celebrates a festival, called the Feast of Cedars.

We have now probably more cedars in England than are left on Mount Libanus. "It is matter of surprise to me," says Mr. Miller, "that this tree was not more cultivated in England formerly; (for, till within a few years past, there were but few here), since it would be a

great ornament to barren bleak mountains, where few other trees will grow so well; it being a native of the coldest parts of Mount Libanus, where the snow continues great part of the year. From the observations I have made of the trees now growing in England, I find that such as have been planted in a strong, rich, loamy earth, have made a poor progress, in comparison with those which have grown upon a stony meagre soil." That these trees are of quick growth, is evident from four of them in the botanic garden at Chelsea, which, as I have been credibly informed, were planted there in the year 1683, and at that time were not above three feet high. Sir Hans Sloane, in a letter to Mr. Ray, dated March 7, 1684—5, says, "I was the other day at Chelsea, and found that the artifices used by Mr. Watts have been very effectual for the preservation of his plants, insomuch that this severe enough winter has scarce killed any of his fine plants. One thing I much wonder to see, that the *Cedrus Montis Libani*, the inhabitant of a very different climate, should thrive here so well, as without pot or greenhouse to be able to propagate itself by layers this spring. Seeds sown last autumn have as yet thriven very well, and are like to hold out. The main artifice I used to them, has been to keep them from the winds, which seem to give a great additional force to the cold, in destroying tender plants."

Two of these trees were in 1776 upwards of twelve feet and a half in girth, at two feet above the ground, and their branches extended more than twenty feet on every side their trunks; which branches, though they were produced twelve or fourteen feet above the surface, did at every termination hang very near the ground, and thereby afford a goodly shade in the hottest season of the year. In August, 1793, the girth of the largest, at three feet from the ground, was twelve feet, eleven inches and a half, of the smaller, twelve feet and a quarter of an inch, as measured by Sir Joseph Banks.

The soil in which these trees were planted, is a lean hungry sand mixed with gravel, the surface of which is scarcely two feet deep, before a hard rocky gravel appears. They stood at four corners of a pond, bricked up within two feet of their trunks; so that their

roots, having no room to spread on one side, were cramped in their growth; but whether their standing so near the water might not have been advantageous to them, I cannot say; but, certainly, if their roots had had full scope in the ground, they would have made a greater progress.

The roots, finding themselves stopped by the brick wall, tended downwards, and spread themselves in the moist earth under the water, which promoted greatly the growth of the trees; for some years after the time of which Mr. Miller speaks, this pond having been filled up, these noble trees decayed, and were quickly ruined for want of their accustomed supply of water. Lopping or cutting these trees is very injurious to them, more perhaps than to any other of the resinous trees, in retarding their growth; for two of the four trees above mentioned, having been unadvisedly planted near a green-house, when they began to grow large, had their branches lopped, to let the sun into the house, whereby they were so much checked as to be little more than half the size of the other two.

All these trees produced, for several years, large quantities of catkins, or male flowers; but only three of them had, in 1766, produced cones, nor was it above thirty-five years before that period that these ripened their cones, so as to perfect the seeds; but, after that, the seeds that fell out of the cones on the ground near them produced plants in plenty, which came up spontaneously. Since, then, we find that the cedar is so far naturalized to our country as to produce ripe seeds; we need not fear a supply, without depending on the cones from the Levant; but they are more apt to produce and ripen their cones in hard winters than in mild ones; which is a plain indication that they will succeed, even in the coldest parts of Scotland, where, as well as in England, they may be propagated to great advantage.

The cedars at Chelsea are supposed, in the *New Catalogue*, to have been the first known to be planted in England. Dr. Hunter, in his additions to Evelyn, says, "that we do not know when and by whom the cedar was first introduced here." Dr. Turner, when he treats of the pine tree and other trees of that kind, says nothing of it. Gerard mentions it

not as growing here, and Parkinson says "the branches, some say, all grow upright, but others straight out." It is very certain, from what Mr. Evelyn says, "that it was not cultivated in England in 1664;" but, from the warm manner in which he expresses himself on this head, it is probable that it soon after became an object of the planter's attention. Mr. Evelyn informs us, "that he received cones and seeds of the few remaining trees on Libanus," and adds, "Why they should not thrive in old England, I know not, save for want of industry and trial."—*Silva*, 154."

The old palace, or manor-house, at Enfield, was occupied by Robert Uvedale, L.L.D., who kept a flourishing school there about the year 1670. In the gardens, among other curious trees planted by the doctor; there is a fine cedar. The body, exclusive of the boughs, contained, in 1779, about two hundred and ninety-three cubic feet. Girt at top, three feet seven inches; second girt, seven feet nine inches; third girt, fourteen feet; fourth, fourteen feet six inches. The height, forty-five feet nine inches; eight feet having been broken off from its top by the hurricane in 1703. In 1793, it was twelve feet in girt at three feet from the ground; in 1815, the girt, at eighteen inches from the ground, was fifteen feet eight inches; and on the 15th of March, 1821, at the same height from the ground, the girt was sixteen feet one inch. The total length of timber at that time was sixty-eight feet six inches; perpendicular height, sixty-four feet eight inches; solid content, five hundred and forty-eight cubic feet, exclusive of the branches. Extent of the branches from north-east to south-west eighty-seven feet.

This cedar was destined to the axe by the late Mr. Callaway, after he had purchased the old palace at Enfield; the saw-pit was already prepared, and a trench dug round the tree, but some of the inhabitants of Enfield, the admirers of this tree, particularly the late Richard Gough, Esq. and Dr. Sherwin, interfered; at whose request the tree was spared, and it is now standing, the ornament of the place. The branches in general spread horizontally, but at the height of about forty feet, and a little below the part where the main trunk was broken off, a branch has taken nearly a perpendicular direction, and, viewed on

the side opposite to the place where the trunk was broken by high wind in 1703, appears to be a continuation of the body of the tree; the extremity of this branch is sixty-four feet eight inches from the ground. The dimensions already noticed, were taken by Mr. May, who occupies the only part of the old structure now remaining, as a boarding-school, in whose garden the cedar stands in a flourishing condition. This tree has been erroneously stated to have been planted in the year 1576; but it seems to be pretty certain, that Dr. Uvedale planted it at the time he occupied the palace as a boarding-school, about the year 1665, which makes this tree one hundred and sixty-eight years old. The tree may be seen from almost every part of Enfield, whether on the hill or in the valley. The wood does not differ in appearance from white deal, nor does it seem harder, and has an agreeable smell.

Several other cedars of considerable size are or were scattered about in different parts of this kingdom; some of the finest of these were planted at Whifton, by Archibald, Duke of Argyle. One of the most remarkable was blown down by the hurricane that happened on the 1st of January, 1779. It grew on the north side of Hendon Place, in Middlesex. Its height was seventy feet, the diameter of the horizontal extent of the branches was a hundred feet, the circumference of the trunk, seven feet above the ground, sixteen feet, and at twelve feet above the ground twenty-one feet. At this latter height it began to branch, and its limbs, about ten in number, were from six to twelve feet in circumference. * This tree is supposed to have been two hundred years old, and tradition says, was planted by Queen Elizabeth. Tradition is seldom to be depended on, and the "Virgin Queen" is a great favourite with tradition mongers. But is it probable, if such a tree existed in 1579, that Gerard, Parkinson, and Evelyn, should know nothing of it? When blown down it was perfectly sound, and seemed as if not grown to maturity; it is probable, therefore, that it was not two hundred years old, for the cedars at Chelsea attained their full size and decayed in less than a century.

The following were the dimensions of a fine cedar growing at Hillingdon, near Uxbridge. The height, fifty-three feet,

the extent of the branches from east to west ninety-six feet, from north to south, eighty-nine feet; the circumference of the trunk close to the ground thirteen feet and a half, seven feet above the ground twelve feet and a half, and at the height of thirteen feet and a half, just under the branches, fifteen feet eight inches. It had two principal branches, one of which was forked eighteen inches above its origin; before it divided, it measured twelve feet round; after its division, one of the forks measured eight feet and a half, the other seven feet ten inches. The other primary branch, at its origin, measured ten feet, and soon dividing, threw out two secondary ones, each five feet and a half. Its age was supposed to be one hundred and sixteen years.

The only relic of Dr. James Sherard's famous botanic garden at Eltham, so elegantly displayed by Dilenius, is a cedar of Lebanon, which girths nine feet at three feet from the ground. It is now in the possession of John Dorington, Esq. Another of these trees is in the Fellows' garden at Emanuel College, in Cambridge, on a lawn, by the side of the pond. It was planted, in the year 1730, by professor John Martyn, then a member of that college. The leading shoot being killed by the severe winter of 1740, its height is not very considerable; in form it is pyramidal, like the spruce fir, and its branches almost from the bottom.

Mr. Lambert, in his valuable work on the *Genus Pinus*, observes, "that at least, the accounts given by the ancients of the long duration of their cedar, very ill accord with the species now under consideration, whose wood is no more than a very inferior kind of deal, with little or no smell, and of a soft texture, evidently of short duration. This appears by a table in the possession of Sir Joseph Banks, made of the above-mentioned Hillingdon cedar, one of the largest that ever grew in this country. The word *cedrus*, seems in many cases to be ambiguously used by the Greek and Latin authors, but appears in general much better to apply to the *Cupressus horizontalis*, which I have no doubt is a distinct species from *Cedrus semperoriens*, of Linnæus." Sprengel conjectures it to have been the *Juniperus oxycedrus*; but it appears highly probable, from some interesting observations made at Tangier, by Mr.

Drummond Hay, that the indestructible cedar wood was the beautiful, hard, deep brown timber of *Thuja articulata*, the Sandarac tree (see *Thuja*).

Mr. Evelyn remarks, that this cedar is of so dry a nature, that it does not well endure to be fastened with nails, from which it usually shrinks; and, therefore, pins of the same wood are better.

Perhaps it may not be superfluous here to mention that the wood used for black-lead pencils is not *Abies cedrus*, but *Juniperus Bermudiana*.

Cedar of Lebanon cones should be kept one year before the seeds are taken out; those cones that are brought from the Levant are generally supposed to retain their vegetative power, for several years.

They seldom ripen their cones in this country till January. Their maturity may be ascertained, by cutting into the side of a cone to the seat of the seeds, previously to gathering the intended quantity.

The seeds should be sown about the middle of March in pots, or boxes, nearly half an inch deep. The following is the best mode of extricating them from the cones. Let a hole be bored with a gimlet exactly through the middle of each cone, from the base to the apex. Put them into a tub of water, in which they should remain until the next day; then let a wooden peg, rather larger than the gimlet, be thrust into the hole, and it will so divide the cones that the different scales may be taken away, and the seeds picked out. In this process, great care must be taken not to bruise the seeds, as they will be very tender. The plants will come up in about seven or eight weeks after the seeds have been sown; they should then be removed from the heat of the sun into a shady place, but not under shelter, where they may stand the whole summer; during which time it is necessary to keep them free from weeds, and to water them occasionally. In the winter season a warmer situation is to be sought, and if the weather should prove very severe, perhaps it may be proper to shelter them with mats, or to cover them with a hot-bed frame. At the beginning of the following April, these plants may be pricked out into beds, and placed about four inches apart. Should the weather be dry, it

is advisable to give them shade and moisture until they have taken root. After having been two years in the beds, they must be transferred to the nursery, where they may remain until the place of their final destination be ready. Whilst the young cedars are in the nursery, and indeed after having been planted out, many will have a tendency to droop, probably in their leading shoot. As soon as this is perceived, a stake should be driven into the ground, and the shoots tied to it with matting, to keep them upright. It may not be amiss, in some instances, to lighten the head by cutting off the extremities of some few of the large branches. When the trees have been finally transplanted, however, they should be in general left to nature. Not a knife nor a hatchet should be brought near the old part of the branches, for the lopping the thick wood will not only retard their growth, but injure their beauty. The cedar is extremely tardy in its increase of size, even under the most favourable circumstances, so that the greatest caution ought to be observed in the rearing it; and with the sacred Indian cedar, it should be kept in pots until they are finally committed to the earth in the situation they may be destined subsequently to occupy. They may then be safely removed at any size, if the transplantation is carefully attended to, and their roots uninjured in the operation. It should, however, be remembered, in finally planting out large firs, which have always been kept in pots, that it is absolutely necessary that their roots should be spread out among the earth as much as may be practicable without straining or breaking them, because, while in pots, they necessarily acquire a spiral direction, which they will not afterwards lose, unless it be destroyed at the period of final transplantation; and if they do not lose it, they are apt to be blown over by high winds, on account of their roots not having penetrated into the earth far enough in a horizontal direction, to form the requisite stay to support the trunk and head.

When great importance is attached to the raising the seeds of rare species of fir, it has been found a very beneficial practice to place them between two turfs, placed root to root, the one upon the other, and to watch them till the

seeds begin to sprout; they are then to be sown in the usual way, when every seed will usually succeed.

2. *ABIES DEODARA* (the sacred Indian cedar), *Pinus Deodara*, Lambert, t. 52. Leaves evergreen, in clusters, acute, triangular, stiff. Cones growing in pairs, stalked, oval, obtuse, erect; the scales closely packed, very broad, and nearly even at the margin.

A large tree, with a trunk about four feet in diameter, resembling the cedar of Lebanon, from which it differs in having its cones upon stalks, and its leaves longer and more distinctly three-sided, and also in the quality of its timber. According to Mr. Moorcroft, from whose notes, in Mr. Lambert's *Monograph of the Genus*, we borrow much of our information; the Hindoos call it the *Devadara*, or God Tree, and hold it in great veneration. Its wood is extremely durable, and so resinous, that laths made of it are good for candles. Spars of it have been taken out of Indian temples, known to have been erected from two to four hundred years, uninjured except in those parts which originally were sap-wood. Mr. Moorcroft procured specimens from the starlings of the Zein ool Kuddul Bridge, in Ladakh, where it had been exposed to the water for nearly four hundred years. Mr. Lambert says, that its wood takes an excellent polish, being very close grained, and perhaps the most valuable of the genus; and from its being so strongly impregnated with turpentine, rendered almost imperishable, and justly entitling the tree to the appellation of the "Indian Cedar," which has been bestowed on it. A few plants are now growing in the gardens of Great Britain, having been reared from seeds brought from India by the Hon. Mr. Melville; they are too young for us to judge of their suitableness to this climate, but there is every reason to believe that they will be as hardy as the now common cedar of Lebanon.

A native of the mountains of India, near the town of Rohilcund, on the Alps of Nepal and Thibet, at a height of ten or twelve thousand feet, and also in the woods of Almorah.

Two varieties, or perhaps nearly related species, called the *Shintik* and *Christa roorroo*, are mentioned by Moorcroft as natives of the forests of Ladakh.

To the species now enumerated, the

following almost unknown kinds have to be added:—

3. *ABIES KÆMPFERI*, *Pinus Kämpferi*, Lambert, *Monogr.*, preface, p. vii; *Pinus larix*, Thunberg. *Fl. Japon.*, p. 275.

A native of Japan, found wild upon the mountains of Fako; called by the natives *Leosi*, or *Kara maats Nomi*, according to Kämpfer.

4. *ABIES THUNBERGII*, *Pinus Thunbergii*, Lambert, *Monogr.*, preface, p. vii; *Pinus abies*, Thunb. *Fl. Japon.*, p. 275.

A native of Japan, where it is found even in the city of Jeddo, according to Thunberg.

5. *ABIES MOMI*, Siebold in *verhand. Bataav. genootsch.* xii., p. 12.

Found in Japan, as well as the two following. Its wood is, according to Siebold, in great estimation on account of its whiteness and fine grain.

6. *ABIES TORANO*, Id.

7. *ABIES ARABICI*, Id. Wood brown. Used for various domestic purposes.—See Plates 1, 2, 3, 4.

ABLANIA. See *Trichocarpus*.

ABROMA, formed of α and $\beta\rho\mu\alpha$, no food, not fit for food. In opposition to *Theobroma*, and with which it ranks in the system.

Class 18, 2. *Polyadelphia Dodecandria*. Nat. order of *Columnifera*. *Malvaceæ*, Juss. *Byttneriaceæ*. Tribus ii. *Byttnericæ*. Kunth. Synops. 3. p. 266.

Characters.—Calyx, five parted. Petals, five, with sacculate dilated claws. Cup of stamens, ten-fid, with five segments, each bearing three anthers; the other five petaloid. Styles, five. Capsule, five celled, five winged; seeds many, aril, fixed in a double row to the central subovate, within an oblique membranaceous edge of the partitions, which is thickened and longitudinally bearded.

1. *ABROMA AUGUSTA* (smooth stalked or maple-leaved *Abroma*). Lin. Syst. 696. Bot. reg. t. 518. Leaves cordate or angular, sharply serrulate.

A. *ABROMA WHEELERI* (Wheler's *Abroma*. Retz. Obs. 5. n. 72). Leaves ovate, lanceolate, acuminate, slightly toothed.

This is a tree with a straight trunk, yielding a gum when cut, and filled with a white pith, like the elder. The whole plant is covered with stiff, whitish, shining, decumbent bristles, scarcely visible to the naked eye, easily separating and sticking to the hands, but harm-

less. The flower nodes, are elegant, but have little smell. The corolla is of a dark purple. It flowers from June to October, when its fruit ripens.

Dr. Roxburgh observes, "It is found in various parts of India, growing to be a small tree, flowers most profusely during the rains, and ripens seed in the cold season. The bark abounds with strong white fibres, which make a very good substitute for hemp; and as the plant grows so quickly as to yield two, three, or even four crops of cuttings within the year fit for peeling, &c., it may be advantageously cultivated (in India) for its fibres, which, though not so strong as hemp, make a good common cordage.

It is a native of New South Wales and the Phillipine Islands, and was introduced into Kew Gardens about 1770.

2. *ABROMA FASTUOSA* (prickly-stalked *Abroma*). Sal. par. Lond. t. 102. Adult leaves, with simple and stellate hair beneath. Wings of capsule, subtruncate at end. Branches muricated.

It is a native of New Holland and the Moluccas, and distinguished by the long prickly stalks and elongated taper-pointed angles of the summit of the capsule. In *augustum*, the stalks are smooth and the top corners of the capsule short-pointed; the leaves of this are of a yellower hue, and its stellated pubescence penetrating the skin more easily; the flowers are also smaller, and its seeds not so evidently tuberculated.

"This," Sweet observes, "is a hardy stove genus, and easily managed; the species flowers freely at various seasons, and will grow in the common garden soil; but a mixture of good loam with a little peat is an excellent compost for them. They propagate freely by seeds and cuttings." Introduced in 1800.

ABRONIA, derived from *αβρον*, delicate. Class 5, 1. Nat. Ord. *Nyctagineæ*.

1. *ABRONIA UMBELLATA* (Umbelled *Abronia*).

This is a small, but very beautiful and elegant perennial evergreen herbaceous plant, producing flowers surrounded by an involucre of a charming rose-colour.

It resembles *primula farinosa*, and is propagated by dividing the roots; requires to be planted in sandy peat. A native of California introduced in 1823, and flowers in April and May.

ABROTANOIDES. See *Artemisia Protea*, and *Seriphium*.

ABROTANUM. See *Artemisia*, *Eriocephalus*, *Santolina*, and *Tanacetum*.

ABRUS (Αβρ., soft, delicate; from the extreme tenderness of the leaves. Hence Prior has invented the name of *Abra* for Solomon's favourite mistress).

Class 17, 4. *Diadelphia Decandria*. Nat. Ord. *Leguminosæ*.

Character.—Calyx obscurely four-lobed: the upper lobe broadest. Filaments nine, united into a sheath at bottom, gaping at the back, blunt. Seeds, solitary, spherical.

1. *ABRUS PRECATORIUS*. (Jamaica Wild Liguorice). *Lin. Syst.* p. 641. *Rumph. Amb.* v. p. 57. t. 32.

It grows naturally in both Indies, Guinea and Egypt; it was also found by the late circumnavigators in the Society Islands, about the year 1769. It is a perennial plant, with slender shrubby, twining, branching stalks, by which it will rise to the height of eight or ten feet. In Hindoostan, a pectoral draught is procured from the roots and called *Velti*. The flowers are produced from the side of the stalks in short spikes or bunches; they are of a pale purple colour, and shaped like those of a kidney-bean; these are succeeded by short smooth pods, each containing three or four hard seeds, very smooth, of a glowing scarlet colour, with a black spot or eye on that side which is fastened to the pod.

There are two varieties, one with a white, and the other with a yellow seed, but these do not differ from the former in leaf or stalk.

The seeds of this plant are commonly strung, and worn as ornaments by the natives of those countries where the plant grows wild: they are frequently brought to Europe from Guinea, and the East and West Indies, and wrought into various forms with other hard seeds and shells. In their native countries they are commonly used for weighing precious commodities; they are also strung as beads for rosaries; whence the trivial name of *precatorius*. They are frequently thrown, with other West Indian seeds, on the north-west coast of Scotland. Linnæus affirms that they are extremely deleterious. They are eaten in Egypt; but authors agree that they are the hardest and most indigestible of the pulse tribe,

occasioning violent flatulencies in the bowels.

It is propagated by seeds, sown upon a good hot-bed in the spring; they must be soaked in water twelve or fourteen hours before they are sown, by which means the plants will appear in a fortnight. When the plants are two inches high, they should be transplanted each into a separate pot, filled with light earth, and plunged into a hot-bed of tanner's bark, where they should be shaded from the sun until they have taken new root, always keeping them in the bark stove. They will flower the second year, and sometimes ripen their seeds in England. Cultivated by Bishop Compton at Fulham before 1680.

ABSENTHIUM. See *Artemisia*, *Achillea*, *Anthemis*, *Parthenium*, *Senecio*, *Tanacetum*.

ABSUS. See *Cassia*.

ABUTILON. See *Hibiscus*, *Melochia*, *Malva*, *Napæa*, *Sida*.

ACACIA, ἀκανθία or ακαζία, to sharpen; a name given by Pliny to a thorny tree, of Egypt, supposed to have been the present *Acacia vera*; and which not being appropriated, was taken by Willdenow, in his reformation of the old genus *Mimosa*, as the designation of one of his new divisions (under *Mimosa*, he leaves such species as have a *lomentum* or legume, separating into single-seeded joints. Of these he defines thirty-two, having a five-toothed corolla, and only eight stamens; and to many of them, being sensitive, the name *Mimosa* is properly appropriated); and enumerates a hundred and two species (dividing them into seven sections), to which Mr. R. Browne has made several additions, from New Holland (partly described in Aiton's *Hortus Kewensis*), and many others from the same country have since been introduced.

It is a very extensive genus, inhabiting the tropical parts of both the Old and New World. In Australia, and its dependent islands, the species are widely spread. They are all shrubby and perennial (with the exception of a few that are herbaceous), and make one of the most ornamental families of the green-house plants, some of the species being as curious as beautiful.

Class 23; order 1. Polygamia Monœcia, Nat. Ord. *Lomentaceæ*, Liu. *Leguminosæ*, Juss., *Mimosæ*, Brown.

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The characters are—flowers *polygamous*, Calyx., 45 *toothed*. Corolla, 45 *cleft*, or *formed of 45 petals*. Stamens 10-200. Legume *bivalve*.

The species are extremely variable in the structure of their leaves: some of them have true leaves that are twice or thrice pinnate, with a number of minute leaflets; others have no leaves (properly so called), but in their stead, the leaf-stalks enlarge, and assume the appearance, and no doubt, also the functions of true leaves, and are expanded vertically instead of horizontally, as in leaves of the ordinary construction.

The genus by these very remarkable points of difference in structure, may be conveniently separated into two great sub-divisions. 1 *leafy*; 2 *leafless*.

SECT. 1. Leaves *pinnated in various degrees, spiny, or prickly*.

1. **ACACIA JULIFLORA** (long-flowered Acacia). Spines *stipulary twin*. Leaves *bipinnate, partial of two pair, —proper of twenty pair*. Spikes *axillary, 2-3 cylindrical, pendulous*.

This shrub rises frequently to the height of fourteen or fifteen feet or more. It is of a spreading growth, and furnished with oblong flower spikes, and very long legumes. The flowers are of a crimson colour. It is not so prickly as the *tortuosa*, and its leaves are rather longer. A native of Jamaica, introduced in 1793.

2. **ACACIA TORTUOSA** (writthed Acacia), Browne jam. 251, 1. Spines *stipulary*. Leaves *bipinnate, four-paired, a gland between the lowest*. Pinnae *sixteen paired, spikes globular*.

This is a shrub, with a branching stem, and a brown bark. The spines are in pairs, almost united at the base, stretched out, and half an inch in length. The flowers are yellow. The legume is horned, roundish, torulose, drawn to a point at both ends, and black. The seeds are subovate and black.

Between the outer coat of the pod and the inner membrane separating the seeds, there is a liquor of the consistence and colour of a syrup, which smells very strong, and is bitter and astringent. Browne says, "that this would prove an excellent medicine, where rough astringents are requisite." The whole plant is bitter, and the flowers have a very strong smell. Indeed, the smell of all the parts is so

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rank and disagreeable, that it cannot be used for fire-wood. Even the very milk of the cattle that browse upon the tender shoots in dry weather becomes rank. Native of Jamaica, where it is common on low lands; is called the *acacia* bush, and chiefly employed for hedges.

3. *ACACIA RETICULATA* (netted *Acacia*), Pluk. phyt. t. 123, f. 2. Spines *stipulary, straight, almost the length of leaflets*. Leaflets *oblong, linear, obtuse*. Petiole *terminated by a gland and a prickle*.

This is a tree with rigid branches that are flexuose from bud to bud; under each bud is a pair of horizontal, whitish stipular thorns, the length of the leaves. The pod is oval, compressed, with large scattered seeds; a native of the Cape of Good Hope, introduced in 1816.

4. *ACACIA PULCHELLA* (zigzag spiny *Acacia*), Bot. Cab. 212. Leaves *conjugate, pinnate*. A stalked gland between the pinnæ, which consist of 5-7 pair. Stipule *spiny, as long as leaves*.

This is a beautiful little plant, producing its flagrant flowers in May and June in the greatest profusion, the leaves are extremely delicate, and the whole plant forms a small prickly bush; it must be kept in the greenhouse in the winter, and will increase pretty well by cuttings.

5. *ACACIA STROMBULIFERA* (spiral-podded *Acacia*), Rox. 6, Cor. 2 t. 50. Spines *stipulary*. Leaves *conjugate, pinnate*. Pinnæ of 4-6 pair. Pods *spirally twisted*.

This is an ornamental plant, with scarlet flowers. A native of Peru, introduced in 1825.

6. *ACACIA LEUCOPHLEA* (panicled *Acacia*), Rox. 6, Cor. 2 t. 50. Spines *stipulary twin connate*. Leaves, *bipinnate*: partial of 6-10 pair; proper of many, a gland between the two pairs of partial leaves.

This is a better looking tree than the *Acacia Arabica*; it grows as large, or larger, with a straighter trunk, and sub-erect or spreading branches: the bark is of a whitish colour and smooth. It is a native of dry mountainous countries in the East Indies, flowering in the wet season, and is the *Tella* (or white) *Tooma* of the Telingass.

The wood of this species is not very useful; but the bark is very astringent, and the natives distil an ardent spirit from it. (The process is as follows:—

the fresh bark is cut into small pieces, or bruised, and with a little coarse sugar and toddy (palm juice), put into vessels with water to ferment; when the fermentation is at a proper height (which practice alone can teach), the liquor is committed to the still and a certain quantity of spirit drawn off). The flowers are of a pale yellow, introduced here in 1812.

7. *ACACIA ARABICA* (gum arabic tree), Rox. Cor. t. 149. spines *stipulary, twin spreading*. Leaves *bipinnate*: partial of five pair; proper of many. Spikes, *globose, arillary, stalked*. Legume, *pendulous, 6-10 inches long, necklace form*.

This is the most useful and at the same time the most common species; over every part of the East Indies it grows to a considerable size, and is in flower most part of the year. It is easily recognised by its long curved pods, which are divided into a number of round compressed joints by means of contractions between the seeds. Besides yielding the greatest quantity of gum arabic, the wood is one of the most useful in India; being of a light brownish colour, strong, tough, and durable; the best knees and crooked timber in ship-building are made of it. It is also esteemed for wheel carriages and many other purposes.

The exterior bark is of a dark colour, cracked in various directions, but the inner is fibrous, pretty thick, of a reddish colour, and a most powerful simple astringent. It is employed to tan leather, and to dye various shades of brown, with salt of steel. The unripe legumes possess still more astringency, and make excellent ink with salt of steel. The flowers communicate to water a bright yellow.

The natives mix the gum with the cake of the seeds of sesamum (Gingely), left after the oil is extracted, which they use as an article of diet. It is also much in use amongst the dyers, chintz painters, &c. The natives sometimes substitute a decoction of the bark for soap nuts, to wash their hands with. Cattle are very fond of the green legumes and tender tops of the branches. Dr. Roxburgh proposes the legumes as a cheap substitute for Aleppo galls.

This is considered as being the tree referred to by Dr. Wittenan in his *Travels*, p. 23, as yielding gum arabic in Turkey.

The gum is produced in small clear masses, of a semi-transparent or very pale yellow colour, and care should be taken that it is not intermixed with a gum resembling it, but generally in larger pieces, which is quite worthless. In India, where it is termed the *Babel* tree, it furnishes a very fine gum, which is extensively employed in the place of gum arabic, introduced here in 1820.

8. *ACACIA VERA* (Egyptian gum-arabic *Acacia*, or Egyptian thorn), *Vesling. Egypt. 6. t. 6. Spines stipulary, in pairs, linear awl-shaped. Leaves doubly pinnate; first division of five or six pair; second of many pair; common stalk glandular. Heads axillary, about three together. Legume necklace-like, nearly flat, smooth.*

This tree arrives at a large size in countries where it grows naturally, but in England is rarely seen more than eight or ten feet high. It has the habit of *Acacia Senegal*, but differs in having the bark by no means white, but purple. It is the plant which affords the finest gum arabic of commerce, and was originally referred by Linnæus to the extensive genus *Mimosa*, under the title of *Mimosa nilotica*. It is a native of the sandy deserts of Arabia, Egypt, and the western parts of Asia; and, according to Mr. Jackson, grows abundantly in Barbary, and other parts of Africa. The original gum arabic tree was known to the earlier botanists, and appears to have been cultivated by Gerarde in 1569; but few persons are acquainted with living, or even dried specimens, especially of the legume. We shall give a figure made from a dried specimen (perhaps the only one in this country), in the *Herbarium* of A.B. Lambert, Esq. F.R.S. which was brought from Upper Egypt, by Dr. Clarke, as the true *Acacia vera*.

This, like the preceding species, rises several feet in height; the stem is crooked, and covered with a smooth gray bark, which, on the branches, has a yellowish green, or purple tinge. The flowers are of a bright yellow colour, and collected into globular heads, four or five together, upon slender foot-stalks, that arise from the *axillæ* of the leaves. The legumes are four or five inches long, monili-form, nearly flat, smooth, of a pale brown colour, and contracted into numerous orbicular portions, in each of which is lodged a flat-

tish seed. This character (as a distinguished botanist justly observes) clearly distinguishes the present species from *Acacia arabica*: being more strictly contracted into orbicular portions, with an obliquity well expressed in the wooden cut of *Veslingius*.

According to Hasselquist, the Arabs call it *charad*; and it is this, not *Acacia Senegal*, that produces gum arabic, frankincense, and *succus acaciæ*. This species and *Acacia Senegal* growing together promiscuously, the latter having by chance been brought to Europe instead of the former, and P. Alpinus not having distinguished them, *Acacia Senegal* was generally believed to be the tree that produced the above-mentioned gums; but the genuine tree was known only to those who cultivated it in Egypt, where they call the true one *Charad*, and the other, which is of no value, *Fetue*. They both grow in Lower Egypt, where they are planted in gardens, but they grow wild in the sandy desert, near the ancient sepulchres of the Egyptians.

The gum is gathered in vast quantities from the trees growing in Arabia *petrea*.

"The gum," says Mr. Jackson, "called Morocco or Barbary gum, is produced from a high, thorny tree, called *attaleh*, having leaves similar to the *Arar*, or Gum Sandrac tree, and the juniper. The best kind of Barbary gum is procured from the trees of Morocco, Ras-el-wed, in the province of Suse, and Bled-humme in the province of Abda: the secondary qualities are the produce of the Kedma, Duguella, and other provinces. The tree grows abundantly in the Atlas mountains, and is found also in Bled-el-jerrede. The gum, when new, emits a faint smell, and when stowed in the warehouse, it is heard to crack spontaneously for several weeks; and this cracking is the surest criterion of new gum, as it never does so when old; there is, however, scarcely any difference in the quality. The wood of the tree is hard, and takes a good polish. Its seeds, which are enclosed in a pericarpium, resembling those of the lupin, yield a reddish dye, and are used by the tanners in the preparation of leather. These seeds attract the goats, who are very fond of eating them. The more sickly the tree appears, the more gum it yields; and the hotter the weather,

the more prolific it is. A wet winter, and a cool or mild summer, are unfavourable to gum." Jackson's *History of Morocco*, fol. 84.

The purest and finest gum arabic is brought in caravans to Cairo, by the Arabs of the country round Mount Tor and Sinai: who bring it from this distance on the backs of camels, sown up in bags, and often adulterated with sand and other matters. The gum exudes spontaneously from the bark of the trunk and branches of the tree, in a soft, nearly fluid state, and hardens by exposure to the air, or heat of the sun. It begins to flow in December, immediately after the rainy season, near the flowering time of the tree. Afterwards, as the weather becomes hotter, incisions are made through the bark to assist the transudation of the juice.

It is generally supposed that gum arabic is collected indifferently from several species, and that the gums of Jidda and Bassorah, gum-thur, and East India gum, are only picked samples.

Gum arabic is extensively employed for a number of purposes, both in the arts and in medicine. It forms the basis of crayons, of which common writing ink is a familiar example.

In the countries where this gum is a native, it forms an important article of diet, either alone or mixed with milk, rice, and other substances. Haselquist informs us, "that a caravan, whose provisions were exhausted, preserved themselves from famine by the gum arabic, which they were bringing as merchandise." It is said that six ounces is sufficient for the support of an adult during twenty-four hours.

Medicinally gum exerts no action on the living system, but is a simple demulcent, serving to lubricate abraded surfaces, and involve acrid matters in the *primæ viæ*.

In the solid form it is scarcely ever given, unless to sheath the fauces, and allay the tickling irritation which occasions the cough in catarrh and phthisis pulmonalis, in which cases a piece of it is allowed to dissolve slowly in the mouth. It is chiefly used in a state of mucilage, one ounce being sufficient to render a pint of liquid considerably glutinous.

9 ACACIA SENEGAL (African Acacia), Alp. *Egypt*. t. 15. Spines *stipulary*,

in three's, middle one reflexed. Leaves bipinnate. Partial of 5-6 pair. Proper of many pair. Spikes axillary, cylindrical.

This species is distinguished at first sight by its white bark. The spines also at the base of the leaf are three and not two as in *Acacia vera*.

It produces the gum called *gum Senegal*, which is commonly substituted for arabic.

It is generally in larger masses, and of a darker colour. It is the sort chiefly employed by the calico-printers, but does not go so far in thickening water. It was not till about two hundred years ago, that the gum of Senegal was introduced.

All the gum that was previously employed in medicine or the arts, was brought from Arabia, or from Egypt, whence its name is derived. The three great forests which supply the Senegal market consists of two kinds, one called *Vereck* (white), the other *Nelsueb* (red). Its medicinal qualities are the same as *Acacia Arabica*, introduced 1823.

10. ACACIA CATECHU, (medicinal Acacia), Rox. 6. Coromand. v., 2 t. 175. Spines *stipulary*. Leaves *bipinnate*, many-paired. Glands of the partial ones single. Spikes axillary in pairs or three's peduncled.

The *Acacia catechu*, called in the province of Bahar, *coira* or *caira* grows in great abundance in most of the mountainous districts of Hindoostan. It is a large shrub or tree, fifteen or twenty feet high, covered with a thick, scabrous, ferruginous bark, which is very red within, remarkably astringent, and somewhat bitter. The branches are round, spreading irregularly, and downy when young; the elder ones beset with numerous pairs of small recurved spines, originating in the stipulas. The leaves are placed alternately on the younger branches, and are composed of from fifteen to thirty pair of pinnae, about two inches long, each having numerous leaflets (often forty pair), hardly a quarter of an inch long, covered with short hairs, and of a pale green colour. The flowers are hermaphrodite and male; axillary, on slender cylindrical spikes, three or four inches long, and of a pale yellow colour. The calyx is tubular, hairy, and five-toothed; the corolla of one piece, whitish, divided into five segments, and twice the

length of the calyx. The filaments are numerous, crowned with roundish anthers, and united at the base with the germen, which is oval, supporting a slender style, and terminated by a simple stigma. The fruit is a straight, smooth, pointed legume, or pod, three or four inches long, and less than one broad, containing six or eight roundish seeds.

This is the species from which *catechu* is prepared, it was formerly supposed to be an earth, found in Japan; and hence the name *Terra Japonica*, by which it is still designated occasionally, tends to perpetuate the error. Mr. Kerr, assistant surgeon to the Civil Hospital in Bengal, was the first to describe the tree, in vol. v. of *Medical Observations and Enquiries*, which contains also a very correct plate. He says, "that it is one of the most common trees to be met with in the uncultivated mountains of Rotas, and Pallamow, which are districts of Hindoostan, in the province of Bahar, westward of Bengal; and is frequent in many other parts of that country, in various soils." The following is the mode of preparing the extract, as described by that gentleman:—

"After felling the trees, the manufacturer carefully cuts off all the exterior white part of the wood. The interior coloured wood is cut into chips, with which he fills a narrow-mouthed unglazed earthen pot, pouring water upon them until he sees it among the upper chips; when this is half evaporated by boiling, the decoction without straining, is poured into a flat earthen pot, and boiled to one-third part; this is set in a cool place for one day, and afterwards evaporated by the heat of the sun, stirring it several times in the day; when it is reduced to a considerable thickness, it is spread upon a mat or cloth, which has previously been covered with the ashes of cow-dung; this mass is divided into square or quadrangular pieces by a string, and completely dried by turning them frequently in the sun, until they are fit for sale.

"This extract is called *cutt* by the natives, by the English *cutch*, by authors, *terra Japonica*, *catechu*, *cadtechu*, *cashow*, *cachou*, *caitchu*, *castjoe*, *cachore*, *kaath*, *cate*, &c. In making the extract, the pale brown wood is preferred, as it produces the fine whitish extract:

the darker the wood is, the blacker the extract, and of less value. They are very careful in drying their pots upon the fire before they are used; but very negligent in cutting their chips upon the ground, and not straining the decoction; by which, and the dirty ashes they use, there must be a considerable quantity of earth in the extract, besides what avarice may prompt them to put into it. This the learned have proved from their laborious chemical decompositions. The extract thus prepared, is bought from the manufacturer for twelve or fifteen shillings the eighty pounds weight. I could never learn that the *terra Japonica* was produced from the *areca* or *betel nut*; nor is it indeed credible that it should, notwithstanding that this is the general and received opinion, for the *betel nut* is scarce ever so low in price as the *terra Japonica*, and was it to be extracted from thence, the price would be twenty times dearer than the present sales. Where the *areca nut* is in great plenty, they may perhaps join some of the fruit in making the extract, to answer a double purpose, for the most frequent use of both is in chewing them together as Europeans do tobacco; to these two substances they add a little shell lime, and a leaf called *paur*. Here I am obliged to have recourse to the natives, whom from experience I have found to be very fallacious, therefore I will not answer for their veracity.

"The extract is much used in dyeing and painting chintz, and other cloths; combined with vitriolic salts, a black colour is produced; mixed with oil, they paint the beams and walls of houses, to preserve them, and to defend them from the destructive white ants; it is sometimes mixed with their wall plaster.

"The black physicians of this country divide the diseases of mankind as well as their medicines, into hot and cold; to the cold disease they oppose a hot medicine, and to the hot disease a cooling medicine, among which last, this extract is supposed very powerful. When too profusely used, it is said to be a destroyer of human life. It is given at the rate of two ounces per day to tame vicious horses.

"*The furnace used in making the extract.*—Dig a hole in the earth five or six feet long, two feet deep, and two

feet wide; cover this with an arch of clay, leaving one end open to receive fuel, and take out the ashes; in the arch, three or four circular openings are made, adapted to these bottoms of the pots: the same structure may be raised above ground, made of clay. This furnace is very valuable for its simplicity, easy construction, and small expense of fuel.

"The extract is a principal ingredient in one of their ointments of great repute, composed of blue vitriol four drachms, Japan earth four ounces, alum nine drachms, white resin four ounces; these are reduced to a fine powder, and mixed with the hand, adding olive oil ten ounces, and water sufficient to bring the mass to a proper consistence of an ointment. This ointment is used in every sore, from a fresh wound to a grievous ulcer. A gentleman, (Mr. Robert Hunter, surgeon to the Patna factory), of great practice told me, he used this ointment with success beyond expectation; and he remarks, that whether it is owing to the laxity of the solids in this hot climate, or to some other cause, he is clearly of opinion, that our greasy ointments have not the desired effect. Certain it is they avoid that *empyreuma*, which our ointments often receive in boiling, which cannot be a promising application to a tender sore. As to the virtues of this extract in European practice, I must be silent; they are already better described than I can pretend to do."

Catechu is largely employed in the east, periodically; but especially when used with the *betel nut* for chewing, a practice almost universal over the Indian ointment. In this country it is extensively employed for all those disorders in which a mild, unirritating, powerful astringent is required; such as chronic diarrhœa, dysentery, &c. The Bombay *catechu*, as containing the greatest portion of *tannin*, is that which is best adapted for medicinal use. It is one of the most valuable medicines of this class, and may be advantageously used in all such cases. Dr. Thomson has found "the slow solution of a small piece in the mouth, a certain remedy for the troublesome cough endured by a relaxed *uvula*, hanging into, and irritating the glottis."

Sir H. Davy states, that *catechu* contains one half tannin, thirty-five per

cent of extractive, six to eight of mucilous, and five-sevenths impurities.

11. *ACACIA HÆMATOXYLON* (hoary Acacia). Spines *twin, slender*. Branches *smooth*.

The branchlets, leaves, peduncles, and flowers are covered with hoary velvet down. The leaflets are so crowded together as to appear joined. Flowers yellow and white.

A native of the Cape of Good Hope, introduced 1816. The technical name of this species is taken from its curious and singular leaves, consisting of very minute leaflets, resembling seeds or atoms squeezed laterally so close together as to seem united.

"Mr. Burchell says he passed a grove of *Acacia Hæmatoxylo*, whose soft masses of pale foliage produced an effect extremely beautiful. Their hoary appearance and soft tufted shapes were exceedingly picturesque, and presented a pleasing contrast to the lively green of the surrounding vegetation.

12. *ACACIA TOMENTOSA* (tomentose Acacia). Spines *twin*. Leaves *with ten pairs of pinnæ, each bearing twenty pairs of linear obtuse leaflets*.

A tree fifteen or twenty feet in height, in the East Indies, introduced 1816.

13. *ACACIA SIEBERIANA* (Sieber's Acacia). Spines *twin, connate*. Leaves *with 15-20 pairs of pinnæ, each pinna bearing 25-30 pairs of ciliated leaflets*. Heads of flowers *globose*.

A native of Senegal, differing from *Acacia flexuosa* in the spines being white, not brown, and the peduncles being fewer and twice the length.

14. *ACACIA CAFFRA* (Hottentot Acacia). Spines *stipulary, twin, incurved*. Leaves *bipinnate, partial of twelve pair, proper of many pair*. A depressed gland at the base of petiole.

A tree twelve to twenty feet in height. A native of the Cape of Good Hope.

15. *ACACIA GIRAFFÆ* (cameleopard's Acacia). Spines *stipulary, twin*. Leaves *bipinnate, partial of two pair, proper of twenty pair*. Spikes *axillary, 2-3 cylindrical, pendulous*.

A native of the Cape of Good Hope, in the interior of the country; and the head of the tree, which is thick and spreading, is of a form and appearance that distinguishes it from all other trees of the country.

It is called *Kameel dooru*, because the cameleopard browses chiefly on it; but

its more proper name is *Mookala*, by which it is known to all the Bitchuana nations. It is one of the largest trees in those regions. The wood is exceedingly hard and heavy, of a dark brown colour, and is used by the natives in making spoons, handles of knives, &c.

16. *ACACIA HETERACANTHA* (various spined *Acacia*). Spines *twin, some short and recurved, others straight and longer*. Leaves pubescent.

Found by Burchell growing near the River Gariep or Orange River, Cape of Good Hope, and introduced 1816.

17. *ACACIA MODESTA* (modest *Acacia*), Wall. *pl. rar. Asc.*, 2 p. 27, t. 130. Spines *axillary, subulate*. Leaves *with 2-3 pairs of pinnæ, each bearing four pairs of oblong, glaucous leaflets*.

A shrub eight to twelve feet high, with white fragrant flowers. A native of Hindoostan.

18. *ACACIA SEYAL* (Sejal *Acacia*). Spines *twin, straight, length of the leaves*. Legumes *compressed, falcate, glabrous*.

This shrub is a native of Egypt, where it is called Sejal.

19. *ACACIA ALBIDA* (white leaved *Acacia*). Prickles *stipular, straight*. Leaves *with 3-4 pairs of pinnæ, each bearing 1-10 pairs of mucronate glaucous leaflets*.

A tree twenty feet high, a native of Upper Egypt, near Syene.

20. *ACACIA FLEXUOSA* (flexuose *Acacia*). Spines *twin, connate*. Leaves *bipinnate, partial of sixteen pair, proper of many pair*. A gland on the petiole, and between the two pair of terminal leaves.

An ornamental shrub, six feet high. A native of Camana, South America, introduced 1824.

21. *ACACIA BRACHYACANTHA* (short spined *Acacia*). Spines *stipular, twin hooked*. Leaves *bipinnate*. Pinnæ *of about ten pair*. Leaflets *10-12 pair ciliated*. A native of South America, introduced 1824.

22. *ACACIA PERUVIANA* (Peruvian *Acacia*). Spines *stipulary, setaceous, double*. Leaves *bipinnate*. Pinnæ *of two pair*. Leaflets *of 11-15 pair, blunt, smooth*.

This is an ornamental species, cultivated by cuttings. A native of Peru, introduced 1820.

23. *ACACIA ACICULARIS* (needle spined *Acacia*). Spines *stipular, subulate, twin, straight*.

A native of South America, introduced 1823.

24. *ACACIA CAVENIA* (*cavenia Acacia*). Spines *stipular, twin, about half an inch long, straight*. Leaves *with five pair of pinnæ, each bearing 9-10 pair of linear, oblong leaflets*.

A native of Chili, at Valparaiso, it is used for various purposes, especially as yielding the best charcoal.

25. *ACACIA HORRIDA* (horrid *Acacia*). Spines *stipulary, the length of the leaves*. Leaves *bipinnate, partial ones five-paired*. Branches *even, angular, smooth, with a brown bark*. Spines *in pairs white, and purple at the tip*.

Native of the East and West Indies and Arabia. Mr. Burchell says, "that the first time he met with this tree, he was told by his Hottentot servants that it was the only sort of tree he would see for many days.

"Its height," he says, "did not exceed two feet. Innumerable straight white thorns, from two to four inches long, covered every branch and twig, and the foliage was so fine and thin as to afford a striking instance of a tree furnished with abundance of leaves, being neither dense nor umbrageous. They generally grow in a sandy soil, on the banks of rivers, along the dry beds of periodical streams, or, in little hollows, that retain the water in rainy seasons. It is certainly," he continues, "the most abundant and widely disseminated tree of the extra tropical part of South Africa."

The exceedingly small leaves of these *Acacias* admitted as much sun through them as they threw shadow, and, although the situation was deep in the grove, there was a lightness of colouring in the scene, as beautiful as it was remarkable.

26. *ACACIA STELLATA* (starry *Acacia*). Spines *stipulary*. Leaves *bipinnate*. Petioles *having recurved prickles underneath*. Flowers *racemed*.

Native of Arabia. Loureiro has given the name of *stellata* to a species very different from this, and which Willdenow supposes may be the same with *verticillata*.

27. *ACACIA ASAK* (purple *Acacia*). Spines *in three's, straight*. Leaves *bipinnate, three-paired*. Proper *five-paired*. A gland *between the lowest pair of the partial ones*. Branches *purple, smooth, flexuose*.

It differs from *Acacia Senegal* by its pur-

ple branches, straight spines, and fewness of hairs to the leaves: in that, the leaves are many pairs and wider, and the petiole is terminated by a recurved prickly. Native of Arabia Felix.

23. ACACIA INTSIA (angular-stalked Acacia). *Prickly. Leaves bipinnate. Pinnæ curved inwards. Stem angular. Stipules longer than the prickly. Branches obtuse-angled, even. Flowers yellowish white.* Native of the East Indies, introduced in 1778, by Patrick Russel, M.D. *Intsia* is the Malabar name of the tree.

29. ACACIA CÆSIA (gray Acacia). *Prickly. Leaves bipinnate. Pinnæ oval-oblong, obliquely acuminate.*

Native of the East Indies, introduced in 1773, by Sir Joseph Banks, an ornamental plant with yellow flowers.

30. ACACIA PENNATA (small-leaved Acacia). *Prickly. Leaves bipinnate, very numerous, linear-acicose. Panicle prickly. Heads globular.*

Loureiro describes it as a large procumbent branching shrub, with many short scattered prickles. Leaves more than ten-pairs, with about forty pairs of leaflets. Flowers white, polygamous, in a vast diffused terminating panicle, of very many small globular heads. Native of the East Indies, and of Cochin China, where the bark is converted into a sort of tow, which is used for stopping cracks both in houses and boats.

31. ACACIA EBURNEA (ivory-thorned Acacia). *Spines stipulary, connate, divaricating, round and shaped. Leaves bipinnate. Leaflets two-paired. Proper of many. Spikes globular, peduncled, axillary, several.*

This is a small tree, remarkable for its tremendous spines, at the ends of the branches, next the pale yellow flowers, where there are no leaves; they are two inches long, connate at the base, very straight, round, compressed as in *A. cornigera*, shining very much, and whitish, like ivory, red at the tip; the spines on the lower part of the stem are very short. Peduncles from four to eight, in the axils of the spines, each terminating in small yellow globules of flowers. Native of East Indies. Introduced 1792.

32. ACACIA LATRONUM (rogue's Acacia). *Spines stipulary, connate, divaricating, round, and awl-shaped. Leaves bipinnate. Leaflets four paired. Spikes elongated, peduncled, axillary, commonly in pairs.*

This is a very thorny, branching, depressed, shrub. Spines shining, the colour of milk over all the branches; long, very straight, divaricating. Flowers white. Native of the East Indies; found by Koenig abundantly at the foot of Tripully Mountain, between Tanschu and Tirut Schinapally. These thorny Acacias, with their interwoven branches and terrible thorns, form impenetrable thickets in the mountainous parts of India, and are the secure retreat of smaller animals, birds, and rogues. Introduced 1820.

33. ACACIA NITIDA (shining Acacia). *Spiny. Leaves bipinnate, two-paired. A gland between each. Leaflets five-paired. Spikes globular, peduncled.*

Branches round, purple, flexuose, pubescent. Leaves remote, on very short petioles, very smooth, an inch and a half long. Flowers eight or ten in each head. Found by Koenig in the East Indies.

34. ACACIA FARNESIANA (Farnesiana Acacia, or sponge-tree). *Spines stipulary, distinct. Leaves bipinnate, partial ones eight-paired. Spines globular, sessile. Flowers many-stamened, very fragrant, yellow, in sessile heads.*

Vahl says they are always *peduncled* in the south of Europe and Barbary; and Loureiro informs us that they are so in Cochin China.

Native of Saint Domingo and other islands of the West Indies, as Jamaica, Barbadoes, &c., according to Martyn also of Barbary, Egypt, and Cochin China, at least in a state of cultivation. For the sweetness of its flowers it has been dispersed through most parts of Europe, has been made familiar to the Italian gardens, since it was introduced into the Farnese garden in 1611, and is cultivated in great plenty in Spain and Portugal. The Italian gardeners, who bring over orange trees, &c., bring also many young plants of this to England, under the name of *Gazia*. It was cultivated in 1731 by Mr. Miller, and flowers from June to August.

35. ACACIA CORNIGERA (cuckold tree). *Spines stipulary, connate, divaricating, compressed, and awl-shaped at the tip. Leaves bipinnate. Leaflets from twelve to twenty-paired. Spikes axillary, elongated.*

This tree seldom exceeds twelve feet in height. It has numerous branches forming a pyramidal figure. The leaves

and flowers are small, yellow, and void of scent, in a close cylindrical spike, an inch and a half long. Legumes coriaceous, containing a buttery pulp, in which the seeds are rolled up. The spines are very singular, they are subaxillary and connate at the base, resembling the horns of oxen. They are brown, shining, hollow, and the longest is more than five inches in length. They are all over the tree, and, when the pods are ripe and the leaves are fallen, they have a singular appearance. A sort of ant lodges in these thorns in innumerable quantities, and, if the tree be shaken ever so little, they fall down like a shower of rain and attack the passenger. This tree grows every where in the woods about Carthagea, flowers in June and July, and the seeds ripen in September. It was cultivated in 1691, in the Royal Garden at Hampton Court, but is now rare in England.

36. *ACACIA PARVIFOLIA* (small leaved Acacia). Spines *stipular*. Branches *glabrous*. Leaves with 5-9 pairs of small pinnæ, each bearing 10-20 pairs of small linear leaflets, with a gland situated on the petiole, beneath the lower pair of pinnæ.

A native of the West Indies, on sandy places by the sea-side; the heads of flowers of a white and green colour are void of scent. It grows to about twenty feet in height.

37. *ACACIA CASSIOIDES* (cassia-like Acacia). Spines *solitary*, straight, rising from the sides of the buds, pinnæ bearing 4-6 pairs of lanceolate leaflets.

Native country, flower, and fruit unknown.

38. *ACACIA FERA* (fierce Acacia). Spines *branched*. Leaves *pinnate*. Flowers in *spikes*.

This is a large tree with spreading branches, and large, branched, straight, scattered spines. Native of China and Cochin China, where it is also planted for hedges, which are impenetrable by animals.

39. *ACACIA AMENTACEA* (amentaceous Acacia). Spines *stipular*, straight. Pinnæ bearing two pairs of oblong leaflets.

A tree bearing yellow flowers. Native of New Spain.

40. *ACACIA CORONILLÆFOLIA* (coronilla leaved Acacia). Spines *stipular*, straight. Pinnæ, of 5-9 pairs of linear, obtuse leaflets. Petiole *very short*.

A tree, native of the North of Africa, near Mogador. Introduced 1817.

41. *ACACIA GUMMIFERA* (gum bearing Acacia). Spines *stipular*, straight. Pinnæ bearing six pairs of linear, obtuse leaflets. Legumes *moniliform* covered with white tomentum.

Gum arabic is obtained from this species which is a native of the country round Mogador, where it grows very plentifully, introduced 1823.

42. *ACACIA PILOSA*. Spines *nearly axillary*, stipular, straight. Stipulas *striated*. Pinnæ with thirteen pairs of leaflets. Petioles *very short*. Branches *pilose*.

This species is a native of Jamaica, and exhibits the singularity of having stipular spines, and the stipules existing at the same time. Introduced 1800.

43. *ACACIA HISPIDISSIMA* (very hispid Acacia). Spines *stipular*, straight, slender. Pinnæ with 5-7 pairs of oblong leaflets. Petiole *short*, with a *pedicellate* gland, between the pair of pinnæ.

A shrub from New Holland, very like *A. pulchella*, but differing in the stem, branches, and petioles being beset with stiff, white hairs. Introduced 1800.

44. *ACACIA HÆMASTOMA* (bloody-mouthed Acacia). Spines *stipular*, spreading, straight. Pinnæ with 4-6 pairs of obtuse, rather pilose, leaflets.

A shrub 3-6 feet high, a native of St. Domingo.

45. *ACACIA DETINENS* (detaining Acacia). Spines *stipular*, recurved, very short. Petioles *pubescent*. Legume *oval*, flat, few-seeded.

Mr. Burchell observes, "I was preparing to cut some specimens of it; which the Hottentots observing, warned me to be very careful of doing, or, otherwise, I should certainly be caught fast in its branches.

"In consequence of this advice, I proceeded with the utmost caution; but, with all my care, a small twig caught hold of one sleeve, whilst thinking to disengage it quietly with the other hand, both arms were seized by these rapacious thorns, and the more I tried to extricate myself, the more entangled I became; till at last it seized hold of my hat also, and convinced me that there was no possibility for me to free myself, but by main force, and at the expense of tearing all my clothes. I therefore called out for help, and two of my men came and released me by cutting off the branches by which I was held. In revenge for this ill-treatment, I determined

to give to the tree a name which should serve to caution future travellers against allowing themselves to venture within its clutches."

46. *ACACIA VIRIDIRAMIS* (green-branched Acacia). Spines *stipular, recurved, short*. Pinnæ with 4-6 pairs of small, oval, approximate leaflets.

Burchell says, "that he discovered this very curious kind of acacia, while waiting at *Carel Krieger's Grave*; an indefatigable and fearless hunter, who, having wounded an elephant, was singled out from his party by the irritated animal, seized by his trunk, and dashed with dreadful force to the ground; the enraged creature did not feel its vengeance satisfied till it had pounded the very flesh into the dust, so that nothing remained of this unfortunate man, but, a few of the larger bones." It is a shrub, 4-5 feet in height, with green flexuous branches; the buds are whitish. Introduced 1816.

47. *ACACIA CINERARIA* (ash-coloured Acacia). Prickly. Leaves *conjugate*. Pinna equal. Prickles *curved inwards*.

This prickly shrub is common in most of the sugar-colonies, especially in Antigua, where the leaves are frequently used, mixed with corn, for their riding-horses, and it is thought to free them from bots and worms. It grows in a tufted form, and seldom rises above five or six feet from the ground, though it spreads a great deal more in its growth. Browne names it *Fingrigo*, or *Thorny Mimosa*. According to Linnæus, it is a native of the East Indies.

48. *ACACIA SALINARUM* (salt-marsh Acacia). Spines *solitary, rising from the sides of the buds*. Pinnæ with 19-20 pairs of linear, obtuse leaflets. A gland at the top of the petiole, and one between each pair of leaflets.

A native of Jamaica, growing in salt marshes.

49. *ACACIA VIRIDIFLORA* (green flowered Acacia). Prickles *recurved*. Leaves with 6-15 pairs of pinnæ, each pinna bearing 15-35 pairs of linear, oblong, leaflets. Spikes *cylindrical, solitary*.

A shrub four to six feet in height, with greenish white five-cleft flowers.

A native of the province of Bracmora, near St. Felipe, South America.

50. *ACACIA STELLATA* (starry Acacia). Prickles *stipular, recurved*. Leaves with ten pairs of pinnæ, each pinna bearing thirteen pairs of oblong leaflets,

which are obtuse at both ends. Petioles bearing 2-3 recurved prickles at the origin of each pinna. Racemes of flowers compound.

A tree, native of Mount Kurma, Arabia Felix.

51. *ACACIA VELUTINA* (velvety Acacia). Prickles *petiolar, scattered, hooked*. Leaves with eleven pairs of pinnæ, each pinna bearing 25-35 pairs of oblong, linear, pubescent leaflets. A gland at the base of the petiole, and one between each of the two extreme pairs of pinnæ.

A native of Brazil.

52. *ACACIA ATAXACANTHA* (unorderly spined Acacia). Prickles *hooked, scattered*. Leaves with 6-8 pairs of pinnæ, each bearing 20-30 pairs of ciliated leaflets. Stipulas *lanceolate, dilated on the outside at the base*.

A shrub six to eight feet in height, growing on the banks of the rivers Senegal and Gambia.

53. *ACACIA MACROSTACHYA* (long spik-ed Acacia). Prickles *hooked, scattered*. Stipulas *foliaceous, acute*. Leaves with twenty pairs of pinnæ, each pinna bearing 20-30 pairs of linear, villous, ciliated leaflets. Spikes of flowers *elongated, velvety*.

A shrub eight to ten feet in height, growing in plenty about Bathurst, near the mouth of the river. Native of Senegal and Gambia.

54. *ACACIA MONACANTHA* (one spiked Acacia). Prickles *stipular, solitary, recurved*. Leaves with eight pairs of pinnæ, each pinna bearing 17-20 pairs of oblong leaflets.

A tree introduced in 1818, from Brazil, of which place it is indigenous.

55. *ACACIA SPINI* (Spini's Acacia). Prickles *stipular, hooked, solitary*. Leaves with 3-4 pairs of pinnæ, each pinna bearing 3-5 pairs of elliptical leaflets.

A shrub five to eight feet in height, bearing greenish yellow flowers. Native country unknown.

56. *ACACIA DALEA* (Dalea-like Acacia). Spines *straight, elongated, solitary, pubescent, stipular*. Leaves *bipinnate, pubescent*.

A tree with rose coloured flowers.

57. *ACACIA DIPTERA* (two-winged Acacia). Spines *stipular, very short, subulate*. Pinnæ with 20-24 pairs of linear, obtuse leaflets.

A native of South America, introduced 1818.

58. *ACACIA FERRUGINEA* (rusty Acacia). Spines *stipular, conical, broadest at the base*. Leaves with 3-4 pairs of pinnæ, each with 10-12 pairs of linear, bluntnish, smooth leaflets. Legumes oval, hard, 1-2 seeded.

It is a tree twelve to twenty feet high, a native of Coromandel, introduced 1818.

59. *ACACIA SUBTILIFOLIA* (subtile leaved Acacia). Spines *stipular, nearly erect*. Leaves with 5-10 pairs of pinnæ; each bearing 30-45 pairs of linear leaflets. Legumes oblong, unarmed.

A native of the bank of the river Chota, New Granada.

60. *ACACIA FASCICULATA* (fascicled Acacia). Prickles *scattered or twin*. Leaves with fifteen pairs of pinnæ, each pinna bearing 9-14 pairs of obliquely oblong leaflets. Spikes cylindrical, fasciculately paniced. Flowers white, five-cleft.

A native of Mexico, near Guanaxuato.

61. *ACACIA SUNDRA* (Sundra Acacia). Spines *stipular, hooked leaves, with about twenty pairs of pinnæ, each bearing about the same number of leaflets*.

A native of the coast of Coromandel, in woods and on the mountains, with yellow flowers. It grows from twelve to fifteen feet high; the wood is hard and of a chocolate colour. It is called *sundra* by the Telingas, a native of the East Indies, introduced 1789.

62. *ACACIA TENUIFLORA* (fine-flowered Acacia). Prickles *scattered, incurved*. Leaves with five pairs of pinnæ, each with many pairs of ciliated leaflets. Spikes of flowers filiform, length of the leaves. Legumes 3-5 seeded.

A native of Caraccas.

63. *ACACIA CADUCA* (caducous Acacia). Prickles *scattered, rather hooked*. Leaves with 4-6 pairs of pinnæ, each pinna bearing 5-10 pairs of oblique, oval leaflets. Legumes ciliated with prickles.

A native of Peru, near Gualtaquillo, on the banks of the Cachiyacu.

64. *ACACIA PROSOPOIDES* (prosopis-like Acacia). Prickles *few, hooked at the apex*. Leaves with 2-3 pairs of pinnæ, each pinna bearing 2-3 pair of obtuse leaflets.

This species is a native of New Spain, and bears reddish flowers.

65. *ACACIA HOSTILIS* (hostile Acacia). Prickles *scattered, straight*. Leaves bipinnate, with 4-6 pairs of pinnæ, each

pinna bearing twenty pairs of linear leaflets. Legumes linear, oblong, 2-3 seeded, pubescent.

A shrub, with spreading branches, native of Brazil.

66. *ACACIA ADIANTOIDES* (Adiantum-like Acacia). Prickles, *short, straight*. Leaves with four pairs of pinnæ, each pinna bearing eight pairs of alternate, obtuse, shining leaflets.

A native of Brazil.

67. *ACACIA BURMANNIANA* (Burmans' Acacia). Spines *twin, smooth*. Petioles *pubescent*. Leaves with six pairs of pinnæ, each pinna bearing 15-20 pairs of leaflets.

A shrub, from four to six feet in height, with heads of flowers, solitary, on long peduncles, a native of the East Indies.

68. *ACACIA MAUROCENIA* (Moor's Acacia). Spines *twin*. Leaves with 3-8 pairs of pinnæ, each pinna bearing 10-20 pairs of oblong, smooth leaflets with a gland on the petiole beneath the lower pair of pinnæ. Heads of flowers, white. A native of Morocco.

69. *ACACIA TAMARINDIFOLIA* (tamarind leaved Acacia). Leaves with 4-6 pairs of pinnæ, each pinna bearing 10-15 pairs of oblong, obtuse, quite glabrous leaflets.

A native of the West India Islands and South America. The tree grows to the height of forty feet.

70. *ACACIA ALBA* (white Acacia). Spines *stipular*. Leaves with 7-10 pairs of pinnæ, each pinna bearing 16-20 pairs of leaflets. Heads of flowers, globose, white, disposed in a panicle.

A tree, twenty feet in height, native of the East Indies.

71. *ACACIA ALBICANS* (whitish Acacia). Spines *twin*. Branchlets and petioles *pubescent*. Leaves with 8-9 pairs of pinnæ, each pinna bearing 19-32 pairs of oblong-linear leaflets. Heads of flowers 2-5, aggregate, rising in racemes from the axils of the leaves.

A shrub, found growing on the seashore, near Campeachy, Mexico.

72. *ACACIA COCHLIACANTHA* (twisted spine Acacia). Spines *twin, compressed, concave*. Leaves with 9-10 pairs of pinnæ, each pinna bearing 19-24 pairs of linear, very minute, ciliated leaflets. Heads of flowers axillary.

A shrub, six to ten feet in height, native of Quito, near Guayaquil, South America.

73. *ACACIA INDICA* (Indian Acacia). Spines *twin*. Leaves with 12-15 pairs of pinnae, each pinna bearing 15-18 pairs of oblong-linear leaflets. Heads of flowers axillary.

This species is a tree, twenty feet in height, with the habit of *A. Farnesiana*. Introduced in 1800, a native of the East Indies.

74. *ACACIA PUNCTATA* (Dotted Acacia). Spines *twin*. Leaves with 8-12 pairs of pinnae, each pinna bearing about 25-30 pairs of linear leaflets.

A native of South America.

75. *ACACIA MACRACANTHA* (Long-spined Acacia). Spine *twin*, very long, lanceolate, compressed. Leaves with 14-15 pairs of pinnae, each pinna bearing thirty pairs of leaflets, with a gland between the ultimate pair of pinnae, and two or three between the pairs of leaflets. Flowers yellow.

76. *ACACIA MACRACANTHOIDES* (Macracantha-like Acacia). Spines *twin*, terete. Leaves with 12-14 pairs of pinnae, each pinna bearing about twenty-five pairs of leaflets, with a gland on the petioles beneath.

This species is very like to the preceding, is a native of Jamaica, and was introduced into this country in 1820.

77. *ACACIA DOMINGENSIS* (St. Domingo Acacia). Stipular spines *hooked*. Petioles *prickly, glandless*. Leaves of four pairs of pinnae, each pinna bearing seven pairs of elliptic oblong leaflets.

A native of St. Domingo, with white flowers, and a flat, compressed falcate, quite smooth pod.

78. *ACACIA ACANTHOLOBA* (spiny podded Acacia). Prickles *scattered, hooked*. Petioles *unarmed*. Leaves with 3-4 pairs of pinnae, each bearing 10-12 pairs of leaflets.

A native of South America, with rose coloured flowers, and a flat, membranous pod, prickly on both sides, was introduced in 1823.

79. *ACACIA PSORALEA* (scurfy-branched Acacia). Leaves with 2-5 pairs of pinnae, each pinna bearing 7-8 pairs of oblong-linear leaflets. Rameal prickles *scattered*, with petioles *unarmed*, but are beset with brown warts, as well as the peduncles.

A native of Madagascar.

80. *ACACIA CONCINNA* (neat Acacia). Rameal prickles *scattered*. Leaves with 5-6 pairs of pinnae, each pinna bearing many pairs of ciliated leaflets.

A tree, the branches of which are clothed with a brown villi, and the heads of the flowers disposed in a terminal panicle. Native of the East Indies, introduced 1823.

81. *ACACIA GUADALUPENSIS* (Guadeloupe Acacia). Rameal and petiole prickles *very few, scattered and recurved*. Leaves with 7-9 pairs of pinnae, each pinna bearing 15-20 pairs of oblong linear leaflets.

A shrub, with heads of yellow pedunculate flowers, disposed in a terminal panicle, and flat pods, native of Guadeloupe.

82. *ACACIA INTSIOIDES* (Intsia-like Acacia). Rameal and petiolar prickles *very few, scattered and recurved*. Leaves with six pairs of pinnae, each pinna bearing twenty-five pairs of linear, oblong, somewhat incurved leaflets.

It has very much the appearance of the *Acacia Intsia*. Native country unknown.

83. *ACACIA OBTUSA* (obtuse-leafleted Acacia). Spines *twin*. Leaves with 16-20 pairs of pinnae; each pinna bearing many pairs of ciliated leaflets. Legume linear, arched, glabrous.

A native of Caraccas and of the Orinoco.

84. *ACACIA SUBINERMIS* (almost unarmed Acacia). Spines *twin, subulate, short*. Leaves with 30-40 pairs of pinnae, each pinna bearing 30-40 pairs of leaflets. Legume linear, flat, glabrous, 6-7 seeded.

A native of Jamaica.

85. *ACACIA ACANTHOCARPA* (spiny fruited Acacia). Stipular, prickles *twin, hooked*; petioles *glandless, prickly*. Leaves with 6-8 pairs of pinnae, each pinna bearing 6-15 pairs of oblong leaflets. Legumes flat, compressed, prickly on the rib on both sides.

A shrub six to eight feet in height, with leaves irritable or sensible to the touch and flesh coloured flowers, introduced 1822.

A native of New Spain.

86. *ACACIA REVOLUTA* (revolute-podded Acacia). Stipular, spines *twin, straight*. Petioles *unarmed*. Leaves with 2-5 pairs of pinnae, each pinna bearing 8-12 pairs of leaflets. Pods flat, prickly on the exterior.

A shrub six feet in height, native of Caxamarca.

87. *ACACIA WESTIANA* (West's Acacia). Rameal as well as petiolar and pe-

duncular prickles recurved. Leaves with 8 pairs of pinnae, each pinna bearing 15-27 pairs of linear, acute, leaflets.

A native of the Island of Santa Cruz.

88. *ACACIA CENTROPHYLLA* (spur-leaved Acacia). Prickles numerous, scattered, and recurved. Leaves with 6-9 pairs of pinnae, which are callous and bistipulate at the base, each pinna bearing 8-12 pairs of leaflets.

This species is a native of Jamaica, where it is cultivated in the gardens; its flowers are white, pedunculate, and disposed in a terminal raceme, introduced into this country in 1818.

89. *ACACIA COURBANTIANA* (Courrant's Acacia). Prickles few and recurved; petioles glandless. Leaves with 8-10 pairs of pinnae, each bearing 15-20 pairs of linear, oblong, leaflets.

This species is cultivated in the gardens of Teneriffe, and the whole plant is of a grayish or greenish glaucous colour, and was introduced into this country in 1818.

90. *ACACIA RIPARIA* (river-side Acacia). Prickles scattered, hooked. Leaves with 10-11 pair of pinnae, each pinna bearing 30-50 pairs of linear, ciliated leaflets. Legume, linear, flat, rather hooked at the apex.

A very tall tree, found by Humboldt, growing near the confluence of the Amazon and Chamaga.

91. *ACACIA STRIATA* (striated branched Acacia). Rameal prickles scattered, erect. Leaves with nine pairs of pinnae, each pinna bearing 13-16 pairs of leaflets. Legume, compressed, beset with a few short hairs.

A native of South America.

92. *ACACIA MEGALADENA* (large glanded Acacia). Prickles scattered and minute. Leaves with many pairs of pinnae, each pinna with many pairs of linear, glabrous, leaflets. Legumes rather falcate, compressed, quite glabrous.

A native of the East Indies.

93. *ACACIA ARROPHULA* (Arroophul Acacia). Prickles recurved; panicle terminal.—This species is a tree twenty feet in height, and a native of Sirinagur; was introduced into this country in 1818.

94. *ACACIA LEPTOPHYLLA* (slender leaved Acacia). Prickles stipular, straight, setaceous. Leaves with 4-5 pairs of pinnae, each pinna bearing 12 pairs of oblong, distant leaflets.

A native of South America, introduced 1824.

95. *ACACIA VIRESCENS* (greenish flowered Acacia). Prickles stipular, distinct. Leaves with two pairs of pinnae, each pinna bearing 12-20 pairs of leaflets.

A native of South America, introduced in 1820.

96. *ACACIA PATULA* (spreading Acacia). Spines stipular, connate, twin. Leaves with five pairs of pinnae, each pinna bearing fifteen pairs of linear leaflets.

A native of South America, introduced in 1818.

97. *ACACIA LENTISCIFOLIA* (lentiscus-leaved Acacia). Spines subulate, stipular, straight. Leaves with four pairs of pinnae, each bearing ten pairs of ovate, shining, leaflets.

A native of Mexico.

98. *ACACIA CILIATA* (ciliated leafleted Acacia). Spines stipular, twin, straight. Leaves with 3-4 pairs of pinnae, each pinna bearing thirteen pairs of ciliated leaflets.

A native of South America, introduced in 1822.

99. *ACACIA RHODACANTHA* (red-spined Acacia). Stipular prickles twin; Leaves with seven pairs of pinnae, lower pair the smallest, each pinna bearing 8-20 pairs of leaflets; a depressed gland at the base of the petiole.

100. *ACACIA BANCROFTIANA* (Bancroft's Acacia). Rameal prickles scattered, petiolar ones twin at the origin of the pinnae. Leaves with twenty-five pairs of pinnae, each with 2-5 pairs of obtuse leaflets.

A native of Jamaica, where it attains to the height of twenty feet.

101. *ACACIA POLYCEPHALA* (many-headed Acacia). Prickles scattered and a little hooked. Leaves with 6-9 pairs of pinnae, each pinna bearing twenty pairs of acute leaflets.

A native of the Mauritius, with the branches, peduncles, and petioles, clothed with velvety hairs; the heads of flowers are globose and numerous, and of a reddish brown colour before the flowers expand.

This species is very like *A. concinna*, but differs in the absence of stipulas.

102. *ACACIA HEBECIADA* (young branched Acacia). Spines twin. Leaves with 3-5 pairs of pinnae, each pinna bearing ten pairs of oblong, linear, leaflets.

A dwarf shrub, about two or three feet high, remarkable on account of its trunk or stem running just beneath the surface of the earth, from which arise a number of shoots or branches.

SECT. II. *Unarmed.*

1. *ACACIA PUBESCENS* (downy Acacia). Unarmed. Leaves with 3-10 pairs of pinnae, each pinna bearing 6-18 pairs of linear glabrous leaflets.

Like the *Acacia discolor*, this also comes to us from New Holland, is similar in regard of height and in the colour of its flowers, which appears earlier in the year. In the borders of a good conservatory it will bring forth such an abundance of beautiful yellow blossoms, as to weigh down the slender twigs, and fill the air with its sweet odour. It is indeed a most beautiful plant, and one of the principal ornaments of our green-houses. It is the more worthy of our regard from its presenting us with its beauties in the early part of February, and sometimes even in January.

2. *ACACIA VAGA* (strangling Acacia). Unarmed. Leaves bipinnate, outer pinna larger, curved in, pubescent.

This is a middle-sized tree, with spreading branches. Native of the East Indies, Cochin China, and Brazil, introduced 1818.

3. *ACACIA LATISILIQUA* (broad-podded Acacia). Unarmed. Leaves bipinnate, partial ones, five-paired. Branchlets flexuose. Buds globular.

Native of the West Indies, flowers most part of summer.

4. *ACACIA GLAUCA* (glaucous Acacia). Unarmed. Leaves bipinnate, partial ones six-paired. Pinna very many, with a gland among the lowest. Flowers white.

It flowers in April, and the seeds are ripe in Autumn. Found by Dr. Houston at Vera Cruz, and sent to Europe by him in 1729; but it had been cultivated before in 1690, in the royal garden at Hampton Court.

5. *ACACIA DISCOLOR* (discoloured-leaved Acacia). Unarmed. Leaves with five pairs of pinnae, each pinna bearing 9-12 pairs of oblong obtuse leaflets.

A native of New Holland and Van Dieman's Land, where it has the appellation of *Wattle*, which indeed is given to many other plants and shrubs of this genus.

Its usual height is eight or ten feet, and flowers from March to June. Is

better disposed than the generality of Australian shrubs to suit itself to our climate. It goes through the winter well enough in the neighbourhood of London, but requires to be matted. In Devonshire and Cornwall, we think it might be easily naturalized, as also in the Sister Island. The leaves and stems (which are blue and sometimes tinged with purple), from which its name is derived, form a beautiful contrast with its yellow blossoms, which grow long and erect.

6. *ACACIA ODORATISSIMA* (sweet-scented Acacia). Unarmed. Leaves bipinnate. Leaflets oblong, blunt. Panicles rod-like. Spikelets globular.

This is a lofty tree, with villose somewhat hoary branches, and hoary petioles. Flowers white, very fragrant. Legumes flat, coriaceous, much resembling those of *latisiliqua*, but narrower and less waved. Native of the Island of Ceylon.

7. *ACACIA SPECIOSA* (bladder-senna-leaved Acacia). Unarmed. Leaves bipinnate. Pinna generally nine paired. Leaflets oblong, smooth. A gland above the base of the rib.

This is a very elegant tree, quite smooth. The trunk is round, with an even ash-coloured bark, marked with transverse ferruginous little warts. The flowers are numerous, sessile, or on very short peduncles, extremely sweet, in a handsome head, at the top of which is one flower different from the rest, and abiding longer, which is probably the only fertile one, though all appear to be hermaphrodites.

8. *ACACIA PEREGRINA* (wandering Acacia). Unarmed; Leaves bipinnate. Partial ones sixteen paired. Pinna forty paired, with a petiole gland at the base. Native of South America.

9. *ACACIA JULIBRISSIN* (silk-tassel Acacia). Unarmed. Leaves with from eight to twelve pairs of pinnae. Leaflets in about thirty couples, half oblong, acute, somewhat fringed. Pods flat, membranous, smooth.

It is a native of Persia and the Levant. In England it is seen training against walls, but it only blossoms here occasionally. Those who have made observations on this plant are, however, of opinion that it is not the severity of our winters, so much as the want of a more intense heat in summer to prevent its exuberant growth, and to harden

its shoots so, as to enable them to resist frost.

In the warmest parts of Europe it is now much cultivated. In its native country it is seen only as a small tree, but very beautiful by reason, not only of its large clusters of lilac-flowers, but also by its light airy foliage. The long slender stamens of the flowers wave in the wind, and glisten in the sun like so many silken tassels attached by artificial means to the trees from which they hang dependent. Its specific name is derived from two Persian words, *gul* a rose, and *abruchim*, silk.

10. *ACACIA COMOSA* (bearded *Acacia*). Unarmed *arboreous*. Leaves *bipinnate, tortuous*. Pinnæ *nine or ten-paired, oval, retuse at the base*. Flowers *panicled, monadelphous*.

Native of Jamaica.

11. *ACACIA LEBBECK* (Lebbek *Acacia*). Unarmed *arboreous*. Leaves *bipinnate*. Pinnæ *oval, oblong*. Flowers *in bundles*. Stem *arboreous*.

This is cultivated in the gardens at Cairo, where it flowers in June and becomes a large tree, and in our gardens it is much admired for the sake of the beauty and scent of the flowers. The Arabs call it *lebak*, which Linnæus has adopted for the trivial name.

12. *ACACIA ELEPHANTHORHIZA* (elephantroot *Acacia*). Unarmed. Leaves *with 10-12 pairs of pinnæ, each pinna bearing 25 pairs of linear leaflets*.

A very beautiful species, most remarkable for its low growth, being seldom more than a foot and a half in height, and of a herbaceous nature, the stems dying down to the ground every year. Its leaves, bunches of flowers, and pods, are longer than any of the arboreous species. Its roots constitute a favourite food for the elephant. The seeds are worn by the Bushmen made up into a necklace.

13. *ACACIA NIGRICANS* (unequalled winged *Acacia*). Unarmed. Leaves *bipinnate, partial of two pair, proper of two or seven pair, stipular, setaceous*.

This is a very beautiful shrub, with delicate and singular foliage. With us it flowers freely during the spring months. It is one of those plants which are seen to the greatest advantage in the full ground in a conservatory, as it then flowers much stronger than in a pot. Its soil should be loam and peat, and it may be increased by cuttings.

14. *ACACIA GUIANENSIS* (Guiana *Acacia*). Leaves *bipinnate*; partial and proper of *ten pairs, elliptical and blunt*. Gland of petiole *convex*. Spikes *filiform, solitary, axillary*.

This species of *Acacia* attains to the height of forty feet, and its trunk is more than a foot in diameter. The wood is white, it flowers in November, and ripens its fruit in February. It is propagated by cuttings, and is a native of Cayenne, was introduced in 1803.

15. *ACACIA LOPHANTHA* (two-spiked *Acacia*). Leaves *bipinnate*, partial of *9-12 pairs*, proper of *many pairs, lanceolate, veinless*.

An elegant green-house shrub, but rather impatient of cold; best suited for the conservatory, where it makes a very magnificent appearance. Flowers twice a year, propagated by cuttings and by seeds, which it produces freely.

16. *ACACIA MOLLISSIMA* (soft *Acacia*). Leaves *bipinnate*, partial of *8-18 pair*, proper of *many pair, linear, very close, downy*. A gland *between every pair*.

A slender thornless tree, from twenty to thirty feet in height, a native of Van Dieman's Land, where it is called by the appellation of *green wattle*. It is far from common in our collections, and requires the protection of a green-house. The flowers diffuse a bitterish but not unpleasant scent.

17. *ACACIA SCANDENS* (climbing *Acacia*). Leaves *conjugate, pinnate, terminated by a tendril*. Pinnæ of *four pair*. Petals *five*, stem *climbing*.

An elegant flowering shrub, from the Brazils, introduced 1780.

18. *ACACIA LAMBERTIANA* (Cowan's *Acacia*). Unarmed. Leaves *bipinnate*, partial of *two pair*, proper of *two pair, villose*. Petiole *without glands*. Head *globose*.

This species was first raised by Mr. Lambert, at Boyton, from Mexican seed, transmitted by Mr. Cowan. It is a fine flowered shrub, and requires to be kept in the hot-house.

19. *ACACIA TETRAGONA*. (Tetragonal branched *Acacia*). Unarmed; leaves *with 5-6 pairs of pinnæ, each pinna bearing 16-29 pairs of linear, acute, leaflets*.

20. *ACACIA VENUSTA* (charming *Acacia*). Unarmed. Leaves *bipinnate*. Pinnæ of *3-5 pair*. Leaflets of *15-20 pair falcate, acute, smoothish*.

A native of South America.

21. *ACACIA ARBOREA* (tree Acacia). Leaves *bipinnate*, partial of seven pair, proper of seventeen pair. Spikes *axillary*. Pods *twisted*.

A tree, forty feet in height, with branches covered with rusty velvety down. Flowers of a pale flesh-colour, native of Jamaica, and was introduced 1768.

22. *ACACIA QUADRANGULARIS* (quadrangular Acacia). Leaves of five pairs. Pinnæ of many pairs. Leaflets *linear, acute, ciliated*. Rachis of leaves *downy*. Heads *axillary, on long stalks*.

This species is very nearly allied to *A. portoricensis*. It is a shrub four feet high, with white flowers, which are very ornamental, requires to be cultivated in the stove.

Introduced in 1825.

23. *ACACIA DEALBATA* (whitened Acacia). Leaves of fifteen pairs of pinnæ, each pinna 30-35 pair. Leaflets *equal-sided, minute, downy*. Racemes *lateral*.

A tree ten to twenty feet in height, producing yellow flowers. Introduced in 1820.

24. *ACACIA PORTORICENSIS* (Porto-Rico Acacia). Leaves *bipinnate*. Partial of five pair. Proper of many pair, *linear, acute*. Spikes 3, *axillary*. Calyx *ciliated at edge*.

A shrub six to ten feet in height, flowering from June to August.

25. *ACACIA LEUCOCEPHALA* (white-headed Acacia): Leaves *bipinnate*. Pinnæ of 4-5 pairs. Leaflets of 12-15 pair, *oblong, linear, acute*. Petioles, *downy*.

This species is very nearly allied to *A. glauca*, but differs in the pod, being broader, shorter, and standing on a long stalk.

26. *ACACIA DECURRENS* (decurent Acacia). Leaves *bipinnate*. Partial of eleven pair. Proper of many pair. A gland between every pair of partial ones.

A native of New Holland about Port Jackson, where it is a tree ten to twenty feet in height, and introduced from there in 1790.

27. *ACACIA OUYRAREMA* (ouytarema Acacia). Unarmed. Leaves with six pairs of pinnæ, each pinna bearing thirty pairs of *oblong, obtuse, glabrous, two-nerved* leaflets, *obliquely truncate at the base*.

Native of Guiana; a tree.

28. *ACACIA STIPULACEA* (large stipuled Acacia). Unarmed. Leaves with 5-7 pairs of pinnæ, each pinna bearing 20-30 pairs of *oblong, leaflets*.

A native of Bengal, brought to England in 1800. A tree of forty feet high.

29. *ACACIA BIMUCRONATA* (two-pointed leaved Acacia). Unarmed. Branches, petioles, and pedicels *pubescent*. Leaves with 6-8 pairs of pinnæ, each pinna bearing twenty-eight pairs of *oblong, linear, glabrous* leaflets.

Native of Brazil. Tree.

30. *ACACIA FILICINA* (fern-like Acacia). Unarmed. Branches *terete*. Leaves with usually six pairs of pinnæ, each pinna bearing 50-70 pairs of *linear, acute, ciliated* leaflets.

This is a shrub, a native of Mexico, where it is found from three to six feet high.

31. *ACACIA VILLOSA* (villous Acacia). Unarmed. Leaves with 5-6 pairs of pinnæ, each pinna bearing about twelve pairs of *ovate* leaflets.

Native of Jamaica, where it grows on the mountains. A shrub of from six to eight feet in height. Its flowers are white.

32. *ACACIA FRONDOSA* (leafy Acacia). Unarmed. Leaves with six pairs of pinnæ, each pinna bearing fourteen pairs of *distant, lanceolate* leaflets.

It is a native of the East Indies, is a tree, and was introduced here in 1816.

33. *ACACIA JAVANICA* (Java Acacia). Leaves with four pairs of pinnæ, each pair of pinna bearing seventy pairs of *oval* leaflets.

A native of Java: a tree, and is remarkable for the number of its oval, lucid, and obtuse leaflets.

34. *ACACIA GUACHAPELE* (Guachapele Acacia.) Unarmed. Leaves with 4-5 pairs of pinnæ, each pinna bearing 5-6 pairs of *obovate* leaflets.

Guachapele is the vernacular name of the tree. It is a native of Quito, and grows in the woods, near Guayaquil, to the height of fifty or sixty feet.

35. *ACACIA HADIENSIS* (Hadie Acacia). Unarmed. Leaves with three pairs of pinnæ, each pinna bearing about fourteen pairs of *oval, linear* leaflets.

A native of Arabia.

36. *ACACIA PRISMATICA* (Prismatic Acacia). Unarmed. Leaves with 7-8 pairs of pinnæ, each pinna bearing

14-17 pairs of oblong, two coloured leaflets.—Said to be allied to the *Acacia discolor*, but little is as yet known of this tree.

37. *ACACIA HOUSTONI* (Houston's *Acacia*). *Unarmed; leaves bipinnate, abrupt, commonly six parted; pinna many paired; leaflets somewhat confluent; racemes compound, terminating. Inflorescence as in Acacia grandiflora, but the flowers smaller.*—This is one of the most beautiful species of the genus. The petals being very large, and of a fine purple colour, with their stamens stretched out to considerable distance beyond the petals, the flowers make a charming appearance when the trees are covered with them; and, when the pods, which are ferruginous, are ripe and hanging plentifully from every bough, the view of the trees is very pleasing at a small distance. The seeds were sent to Europe from South America, by Dr. William Houston, in 1729. In our hot-houses it grows to a tall tree-like shrub, flowering freely, and producing abundance of suckers when cut down, which, from its lofty growth, is necessary in the stove].

The species in this *division* must be placed in stoves in the winter, and in summer must be but a short time exposed to the open air, and have a warm situation. They are propagated by sowing their seeds on a hot-bed in the spring of the year, which will in a short time appear above ground, and in about five or six weeks after, be fit to transplant, when a fresh hot-bed is to be prepared for them, and should be pretty warm; the next thing to be provided is a quantity of small halfpenny pots, which are to be filled with fresh, light, sandy earth; these should be plunged into the hot-bed, but not into dung; for if these beds are made with warm horse-dung, they ought to be covered with earth as deep as the pots, whose bottoms should not rest upon the dung, otherwise the roots of the plants may suffer by too much heat; but beds of tanner's bark seldom heat so violently. As soon as the earth in the pots is warm, which will be in two or three days, you should carefully take up the young plants out of the first hot-bed, planting four or five plants into each of these pots, giving them a gentle watering to settle the earth to their roots, and screening them with mats over the glasses

from the heat of the sun, until they have taken root; after which time you must give them air, by raising the glasses in proportion to the heat of the weather, or to the strength of the plants.

The *Acacias vera*, *Farnesiana*, and *Cornigera*, are tender, especially while young, therefore should have a hot-bed of tanner's bark; and, as they increase in bulk, should be shifted into larger pots. The earth for these should be a little lighter, and more inclined to a sand, but never plant them in pots that are too large, which is full as bad to these as to orange-trees; neither give them too much water, especially in winter. The first sort being the hardiest of the three, will, when grown to be woody, stand in a common stove, which should be kept to the point of temperate heat in winter, and in the summer-time, in warm weather, may enjoy the open free air; but the second and third must have a bark-stove in winter. They should not be exposed to the open air in summer, at least for four or five years, until they are grown very woody, for they are very tender, and with great difficulty preserved in this climate. The stove in which they should be placed in winter, must be kept above the temperate point, as marked in the botanical thermometers. They should have very little water in winter, but in summer-time will require frequent refreshings, though at that season it should not be given them in great quantities at one time.

The *A. Cornigera* sheds its leaves before the new ones come on, so that it is naked of leaves about a month or six weeks in the spring of the year, which has occasioned some people to throw them away as dead, when, if they had let them remain, they would have come out fresh again. This I thought proper to mention in order to caution people not to be too hasty in throwing out trees for dead, but preserve them through the succeeding summer, to see if they will shoot again; for I have known several plants, which, after having been given over by unskilful persons for dead, have the July following shot out vigorously again; and others, which have died to the surface of the earth, have risen again from the root. The *horned Acacias* are very often destitute of leaves for two or three months, appearing to have no life; but they will put out fresh leaves towards autumn, which is commonly the season

when they are most vigorous. These should be exposed in the summer season for about two months, to clear them from insects (which greatly infest them), in a place defended from strong winds; and in the winter they require a moderate degree of warmth. All the other sorts here mentioned are propagated by seeds, which, seldom ripening in this country, must be procured from abroad, particularly at Campeachy, where there is great variety, many sorts of which have been hitherto unknown to botanists.

In bringing over the seeds of these trees, they should be taken out of the pods when gathered, and put up in papers, and ought to have tobacco, or some other noxious herb, put between the papers, to keep off insects, otherwise the seeds will be eaten and destroyed before they arrive in England, for the insects deposit their eggs in small punctures which they make in the pods; and as these are soon hatched, so they immediately attack the seeds for food, and eat holes through them, by which they are spoiled from growing. This has often happened to seeds which have been sent me from America. There are several of these Acacias, which are very tender while they are young; but, after two or three years' growth, become hardy enough to bear the open air in summer, though scarce any of them will live through the winter in a green-house, unless they have some warmth in very cold weather.

[Div. 2.—LEAFLESS. *Leaves of two forms, pinnated in seedling plants; in the adult plants, consisting of nothing but the vertically distended leaf-stalk, called PHYLLODIA, with stipulas, either spinose or wanting.*—The species in this division are mostly natives of New Holland.

1. ACACIA LUNATA (lunate-leaved Acacia). Bot. Cab. 384. *Petioles half oblong, somewhat falcate, tapered at base, with a little gland on the convex side; branches smooth.*—The leaves of this elegant plant are about an inch long, in form resembling the moon at three or four days' old; they are placed edgewise and have a single rib. It flowers in March and April, during which time few plants exceed this in splendour. The flowers are of a most brilliant yellow. Sweet says, "a mixture of sandy loam and peat suits it very well; and young cut-

tings, planted in pots of sand under bell glasses will strike root; it also produces seeds occasionally. Introduced 1810.

2. ACACIA LINIFOLIA (Flax-leaved Acacia). Bot. Mag. 2168. *Unarmed; petioles linear, narrow at base, straight, mucronate; spikes globose; stalk racemose; racemes nearly as long as the Phyllodia.*—In its growth it is somewhat pendulous, and while young it needs a little support. It is difficult to increase in any other way than by seeds, which are not matured in this country. It should be planted in sandy peat earth. Its flowers, which generally appear in the winter time, are sweet scented. A native of New South Wales. Introduced 1820.

3. ACACIA JUNIPERINA (juniper-like Acacia). Bot. Cab. 398. *Unarmed; petioles linear, subulate, mucronate, rigid, pungent, alternate, clustered; spikes globose, solitary.*—A tolerably hardy green-house plant, it attains the height of six or eight feet, with numerous branches: very difficult to propagate in any way except by seeds in a sandy peat and loam.

4. ACACIA LONGISSIMA (longest leaved Acacia). Bot. Reg. 680. *Petioles very long, filiform, one-nerved, spreading; spikes several, axillary, and generally branched.*—This is a spineless numerously branched shrub, acquiring the height of ten feet or more, is in flower a great part of the year, and when in full foliage, handsome; it is remarkable for its long straight narrow leaf. The flowers are very small and of a pale yellow. A native of New Holland, and requires the protection of a green-house.

5. ACACIA ANGUSTIFOLIA (narrow-leaved Acacia). Bot. Cab. 763. *Petioles linear, tapered at base, acute, mucronate, one-nerved, entire; heads racemose, many flowered.*—This plant has some resemblance to the *floribunda*, but the spikes of the flowers are only half the length of the leaves: the long pendulous branches have a pleasing effect, and, when vigorous, the leaves are sometimes three inches in length. A native of New Holland, is well adapted for a green-house, and should be planted in loam and peat, and requires protection from frost.

6. ACACIA HISPIDULA (little harsh Acacia). Bot. Cab. 823. *Unarmed; petioles sessile, oblong, cuspidate, tooth letted, scabrous; spikes, globose, solitary, axillary.*

—This is a low bushy shrub, with rough stiff leaves, and one of the least showy of this extensive family: can only be increased by seed. It is not quite so hardy, as most of the New Holland species, and should therefore be kept in a warm part of the green-house. A native of New South Wales. Introduced in 1794.

7. *ACACIA VERTICILLATA* (whorl-leaved Acacia). Bot. Mag. 110. *Unarmed; petioles linear, subulate, mucronate, rigid, pungent, whorled; spikes cylindrical, solitary.*—This singular species admirably illustrates our second division of this genus, the leaves which first appear on the seedling plants being pinnated (as is represented in Plate 6), whilst those which afterwards come forth grow in whorls. It is properly a green-house plant, and propagated only by seeds, which are to be sown on a gentle hot-bed. It is some years in arriving at its flowering state. A native of New South Wales. Introduced in 1780.

8. *ACACIA SULCATA* (furrowed-leaved Acacia). Bot. Reg. 928. *Petioles filiform, furrowed deeply on each side; points harmless; heads twin; pods wavy.*—A small heath-like shrub. A native of the south-west coast of New Holland, with smooth, yellowish brown wrinkled branches, at present very rare in this country, where it was first introduced in 1803. It is a green-house plant.

9. *ACACIA SAUVEOLENS* (sweet-scented Acacia). Bot. Cab. 730. *Unarmed; petioles linear, narrowed at base, mucronate; spikes globose, stalked, racemose; branches three-cornered.*—This is one of those cheering and acceptable plants which flower during winter, when our gardens are often locked up by frost, or buried in snow; producing its delicate flowers, which have a very agreeable smell, when two years old; they continue a long time. It is a native of New South Wales, and propagated by seed, which should be potted in a mixture of loam and peat.

10. *ACACIA CALAMIFOLIA* (reed-leaved Acacia). Bot. Reg. 839. *Stipules scarcely any; petioles filiform, compressed, cernuous, spreading with an incurved point; pods torulose.*—This species was brought by Mr. J. Richardson to the late Mr. Colvill, in the year 1819, from the south west interior of New South Wales, under the name of the *Bodkin-leaved Acacia*. It is a handsome green-house plant,

with small yellow heads of flowers on a solitary upright slender stalk, six times as short as the leaves, and is easily propagated by cuttings.

11. *ACACIA GENISTIFOLIA* (furze-leaved Acacia). *Stipules spiny, very minute; petioles linear, subulate, pungent, close together; peduncles solitary.*—This is an ornamental hot-house shrub, growing to about five feet in height, producing its yellow flowers from March to August. A native of New South Wales. Introduced in 1825.

12. *ACACIA DIFFUSA* (diffuse Acacia). Bot. Reg. 634. *Stipules very small, upright, deciduous; petioles linear, one-nerved with an oblique point; branches procumbent, diffuse, smooth, angular.*—It is a native of the newly discovered country on the inland side of the Blue Mountains, in New South Wales, and has a showy appearance when in flower, and will prove a valuable addition to our green-houses.

13. *ACACIA MYRTIFOLIA* (myrtle-leaved Acacia). Bot. Mag. 302. *Unarmed; petioles oblong, acuminate, veiny; spikes globose, stalked, racemose.*—A bushy shrub, of a moderate size, requiring the protection of a conservatory, where it grows vigorously, and produces its flowers on the young branches; they are very fragrant, and grow three or four together in little heads, and make so splendid an appearance as scarcely to be recognised as the same species when seen stunted in a green-house. The soil should be loam and peat, and young cuttings root readily in sand under bell glasses placed on a gentle heat.

14. *ACACIA MELANOXYLON* (Blackwooded Acacia). Bot. Mag. 1659. *Petioles lanceolate, oblong-nerved, somewhat falcate; heads racemose; young shoots furzed.*—This species in its native country (Van Dieman's Land) grows into a considerable tree, the bark of the extreme branches is covered with a fine ferruginous pubescence; that of the larger is rough, and of a dark brown colour, approaching to black. With us it is a green-house plant, and reaches to several feet in height before it shows any blossoms. Introduced in 1808. The black wood of Van Dieman's Land is the timber of this species.

15. *ACACIA ARMATA* (simple-leaved prickly Acacia). Bot. Mag. 1653. *Petioles half-oblong, smooth, one-nerved, never parallel with inner edge; stipules*

veiny; branches hirsute.—A green-house shrub, discovered by R. Brown, Esq. on the south-east coast of New Holland, and may be propagated by cuttings. It is capable of enduring a moderate frost, and may be preserved very well in a frame in winter. It loves plenty of water. Introduced 1803.

16. *ACACIA UNDULATA* (wavy-leaved Acacia). Bot. Reg. 843. *Petioles half-oblong, wavy; their inner edge a little truncate; stipules spiny; branches smooth*.—A green-house plant of much beauty and of slender and elegant habit. A native of New Holland, and flowering in the winter months.

17. *ACACIA ALATA* (winged-stalked Acacia). Bot. Reg. 396. *Stem winged two ways; petioles decurrent, one-nerved, terminated by a spine, stipules spiny*.—This species is at once distinguished from its congeners by a two-edged winged stem, and is easily propagated by cuttings. It is a native of New Holland. Introduced 1803.

18. *ACACIA LONGIFOLIA* (long-leaved Acacia). Bot. Rep. 107. *Unarmed; petioles linear, lanceolate, narrowed at each end, three-nerved striated; spikes axillary, double, cylindrical*.—When cultivated in the border of a conservatory, this plant forms a very ornamental shrub, growing to the height of eighteen feet and upwards, and is covered from February to May with masses of fragrant yellow blossom nearly throughout the whole of the branches. A native of New South Wales. Introduced in 1792, among the first of the natural productions of that remarkable country. There are several varieties, in our green-houses, differing with longer and shorter, broader and narrower, paler and deeper, green leaves.

19. *ACACIA GLAUDESCENS* (blunt-leaved Acacia). *Unarmed; petioles lanceolate, sub-falcate, narrowed at base, blunt, about two-nerved, glaucous*.—A green-house shrub, six feet in height. A native of New South Wales. Introduced 1790.

20. *ACACIA FLORIBUNDA* (many flowered Acacia). *Unarmed; petioles linear, narrowed at each end, mucronate, striated; flowers interruptedly spikes; branches round*.—A native of the east coast of New Holland, whence it was introduced here in 1796. It is a very ornamental green-house plant, attaining sometimes to eight feet in height.

21. *ACACIA LINEARIS* (linear-leaved

Acacia). Bot. Mag. 2156. *Petioles narrow, linear, very long, one-nerved, erect, entire; spikes several, axillary, generally branched*.—A green-house shrub. A native of New South Wales. Introduced 1820.

22. *ACACIA STRICTA* (double-headed Acacia). Bot. Mag. t. 1121. *Unarmed; petioles linear, lanceolate, narrowed at base, obtuse; spikes globose, axillary, stalked, double*.—An upright, hardy green house shrub, easily propagated by cuttings, as well as by seeds, which retain their vegetative quality for many years. It is a native of New South Wales. Introduced 1790.

23. *ACACIA FALCATA* (sickle-leaved Acacia). Wendl. Diss. No. ii. t. 14. *Unarmed; petioles oblong, falcate, narrowed at base, acute, veiny; branches two-edged*.—It is rather an ornamental shrub, with a sort of originality in the form of the leaves, that in a moment distinguishes it from every other species of this genus. It forms a tall shrub, with a few slender branches, and is not easily propagated by cuttings. Introduced 1790.

24. *ACACIA VESTITA* (clothed Acacia). Bot. Reg. 698. *Petioles half-elliptical, lanceolate, mucronate, aristate, one-nerved in middle, and branches hispid*.—This species is a stout, upright, soft-furred shrub, of a grayish-green colour, about six feet in height. A native of New Holland. Introduced 1820.

25. *ACACIA DECIPIENS* (paradoxical Acacia). Bot. Mag. t. 1745. *Petioles triangular, outer angle spiny; inner bearing glands; stipules setaceous, caducous; branchlets smooth*.—This curious shrub is about six feet in height; the branches are spreading, and the flowers are very small, yellow, disposed by 8-12 in solitary, axillary heads of the size of a small pea; and is remarkable for the blunders to which it has given rise. When botany was only a science of names, its flowerless branches were taken for the leaves of a kind of fern; and, at a later period, when botanical geography was as yet unheard of, it was believed to be a native of the north-west coast of North America; an opinion about as probable as that would be considered which referred the origin of a race of blackamoors to Great Britain. It is an inhabitant of the south-west coast of New Holland, where it forms a bush of singular aspect. Introduced in 1803.

26. *ACACIA TAXIFOLIA* (yew-leaved Acacia). Bot. Cab. 1225. *Leaves linear, falcate, mucronate, 2-3 nerved, scattered, twice the length of the peduncles; legumes very narrow, elongated.*—This species is about eight feet in height, with many loose somewhat pendulous branches, clothed with rigid pointed leaves, and produces its elegant vivid yellow flowers in March and April. It must be preserved in a green-house during the winter season, and potted in loam and peat earth. A native of New South Wales. Introduced 1825.

27. *ACACIA SOPHORÆ* (Sophora-podded Acacia). Bot. Cab. t. 1351. *Petioles oblong, equal-sided, nerved; spikes twin, sessile, corollas four petals; pods torose.*—It grows freely, and forms a good subject for a conservatory, will readily increase by cuttings which should be potted in loam and peat. Introduced in 1805. A native of Van Dieman's Island.

28. *ACACIA BROWNII* (Brown's Acacia). Bot. Cab. 1333. *Heads of flowers solitary, unarmed; peduncles a little shorter than the phyllodia.*—A neat and rather small growing species, and well adapted for a conservatory, named in honour of that most distinguished botanist, Mr. R. Brown. It requires protection from frost, and may be increased by cuttings or seeds: the soil should be loam and peat.

29. *ACACIA ORNITHOPHORA* (bird-shaped Acacia). Sweet's Fl. Aust. t. 24. *Leaves alternate, oblongly-lanceolate, the point terminated by a short rigid mucro, which turns round like a bird's bill; stipules spinescent.*—A very pretty shrub, with fragrant flowers; the leaves are fancied to represent something like the outline of a small bird, the hooked end forming the beak. It may be increased by cuttings or seeds, planted in loam and peat; young cuttings, planted under bell-glasses in sand, will root freely.

30. *ACACIA GRAVEOLENS* (strong-scented Acacia). Bot. Cab. 1460. *Branches angular, furrowed; leaves linear, lanceolate, ending in a very small hooked point, having two very conspicuous nerves running their whole length.*—In this species the flowers are fragrant, but the smell of the leaves is powerful and unpleasant. It may be increased by cuttings, which should be potted in loam and peat soil. Introduced 1820.

31. *ACACIA IMPRESSA* (feather-nerved

Acacia). Bot. Cab. 1319. *Phyllodia oblong, acuminate at both ends, straight, with one longitudinal nerve in the middle, having feathered nerves running from it, and furnished with one gland in front at the base.*—A shrub, attaining the height of five or six feet, with numerous, regular, brown, smooth, twiggy branches, and having delicate yellow flowers arranged in perfectly globular heads. It is of slender growth, but flowers most abundantly towards the latter end of the summer. A native of New Holland. Introduced 1824.

32. *ACACIA BIFLORA* (two-flowered Acacia). Weudl. Diss. t. 2. *Petioles triangular; outer angle spiny; inner bearing glands; stipules setaceous, spiny; branchlets downy.*—A shrub, two to four feet in height. A native of the western coast of New Holland. Introduced 1803.

33. *ACACIA DORATOXYLON* (spearwood Acacia). *Leaves lanceolate, linear, falcate, striated, attenuated at the base; Spikes cylindrical, axillary, twin, nearly sessile.*—From this species, which attains to twenty feet in height, the spearwood of certain tribes in the interior of New South Wales (of which it is a native) is procured. It grows on pine ridges, near the Macquarie river. Introduced 1824.

34. *ACACIA INTERTEXTA* (interwoven-nerved Acacia). *Leaves long, lanceolate, bluntish, straight, attenuated at the base, two-nerved.*—This species is a native of the Blue Mountains, New South Wales, where it attains from four to six feet in height. Introduced 1824.

35. *ACACIA MUCRONATA* (mucronate-leaved Acacia). Bot. Mag. 2747. *Phyllodia linear, spatulate, one-nerved, rounded, and mucronate at the apex; spikes axillary, solitary or twin, simple.*—A twiggy shrub, from four to five feet in height, with numerous branches, the older ones brown, the rest greenish. The spikes of flowers an inch or more in length (one and frequently two), are produced from the axils of the leaves. A native of New Holland. Introduced 1818.

36. *ACACIA RUBIDA* (reddish Acacia). *Phyllodia ovate, lanceolate, ending in an oblique innocuous mucrone at the apex, bearing a gland on the upper margin; racemes small, pedunculate, axillary, and terminal; the rib and margins of the leaves coloured with red.*—A shrub, from four to six feet in height, frequent

on the edge of rills, on the Blue Mountains, New South Wales. Introduced 1823.

37. *ACACIA LANIGERA* (wool-bearing Acacia). Bot. Mag. t. 2922. *Phyllodia lanceolate, acute, stiff, nerved, ending in a pungent mucrone; heads of flowers twin, axillary; upper part of branches and legumes very woolly.*—This species is from six to eight feet high. A native of New Holland on rocky barren ranges in the interior. Introduced 1824.

38. *ACACIA OLEIFOLIA* (olive-leaved Acacia). Bot. Reg. 1332. *Stipules very small, deciduous; phyllodia ovate, oblong, wavy, mucronate, one-nerved; peduncle filiform, downy, the length of the phyllodia.*—A neat green-house plant, from four to six feet in height, very nearly allied to *Acacia armata*, from which it chiefly differs in the absence of spiny stipules, and in the greater breadth of the leaf-like petioles. A native of New Holland. Introduced 1824.

39. *ACACIA UNDULÆFOLIA* (waving-leaved Acacia). Bot. Cab. 1544. *Phyllodia obliquely, ovate, undulated, one-nerved, ending in a twisted point; heads of flowers axillary, solitary.*—It grows to the height of two or three feet, and flowers in spring; during winter it requires the protection of a green-house; increased with difficulty by cuttings, which should be potted in loam and peat. This species is perfectly distinct from *undulata*, and produces its heads of flowers so abundantly, as to appear like a raceme at the tops of the branches. A native of New South Wales. Introduced 1824.

40. *ACACIA MARGINATA* (margin-leaved Acacia). *Petioles long, lanceolate, somewhat falcate, edged, the anterior edge with one gland; heads racemose, four flowered.*—An ornamental shrub, four feet in height. A native of New South Wales. Introduced 1803.

41. *ACACIA ASPARAGOIDES* (asparagus like Acacia). *Phyllodia linear, sulcate, stiff, mucronate, alternate and crowded; somewhat dilated near the base, where it bears a glandular tooth; heads of flowers, axillary, solitary; branches smooth, diffuse.*—A native of the Blue Mountains, New South Wales. Introduced in 1818.

42. *ACACIA PUNGIONIFORMIS* (dagger-formed leaved Acacia). Wendl. Disseno. 26. t. 9. *Stipules very small, acute, almost permanent; phyllodia smooth, obtuse; pe-*

duncles three times shorter than the phyllodia.—A shrub, from four to five feet in height. A native of the eastern coast of New Holland. Introduced 1818.

43. *ACACIA DOLABRIFORMIS* (hatchet-shaped leaved Acacia). *Phyllodia linear, somewhat falcate, obliquely, and emarginately truncate at the apex, with the lower lobe ending in a pungent mucrone.*—A native of New Holland, where it is a shrub, eight to ten feet in height, with yellow flowers collected into globose heads, a solitary one on each peduncle. Introduced 1818.

44. *ACACIA HASTULATA* (hastulate Acacia). *Stipules spinescent, permanent; phyllodia rhomboid, ending in a spinose acumen with one nerve in the centre.*—A shrub, four feet high. A native of King George's Sound, New Holland. Introduced 1824, propagated by cuttings.

45. *ACACIA SALIGNA* (willow Acacia). Labill. Nov. Holl. 2. tab. 235. *Phyllodia linear, attenuated at both ends, quite entire, almost nerveless; pods contracted between the seeds, loment formed.*—This species attains to the height of ten feet, at Cape Van Dieman, and about Port Jackson, New South Wales, from whence it was introduced in 1818.

46. *ACACIA COCHLEARIS* (spoon-leaved Acacia). Labill. Nov. Holl. 2. t. 234. *Phyllodia linear, lanceolate, many nerved at the base, quite entire, mucronate; leguma 4-5 seeded.*—A green-house plant, from four to six feet in height, flowers in May and June. Introduced from the eastern coast of New Holland in 1818.

47. *ACACIA MANGIUM* (Mangium Acacia). Rhump. Amb. t. 81. *Stipules almost wanting; phyllodia ovate, acute, attenuated at the base.*—A tree, from ten to twenty feet in height. A native of the Moluccas, where it is called *Mangi Goenong*. Introduced in 1820.

48. *ACACIA BREVIFOLIA* (short-leaved Acacia). Bot. Cab. t. 1235. *Phyllodia ovate, elliptic, ending in a spine-like mucrone; one-nerved and feather-nerved, glaucous, smooth, with a gland on one side; heads of flowers racemose, longer than the phyllodia.*—This plant is from three to four feet in height, producing its most brilliant yellow flowers in April. It may be increased by cuttings, and is an admirable subject for a conservatory. A native of New South Wales. Introduced in 1820.

49. *ACACIA AMONA* (pleasing Acacia).

Weud. t. 4. *Phyllodia oblong, tapering much at the base, one-nerved, bearing 1-3 glands in front on the upper margin; heads of flowers racemose, flowers five-lobed*.—A green-house shrub, from four to six feet in height, flowering from April to June. A native of New Holland. Introduced in 1820.

50. *ACACIA VIRGATA* (twiggy Acacia). Bot. Cab. t. 1246. *Flowers collected into globose heads; heads racemose along the axillary peduncles*.—A moderate sized shrub, with many slender branches; flowers plentifully in the month of March. It requires the protection of a green-house, and will increase by cuttings, and thrives in a mixture of loam and peat.

51. *ACACIA SUBULATA* (subulate-leaved Acacia). Bonpl. Nav. t. 45. *Phyllodia very long and linear, subulate and mucronate at the apex; racemes one-half shorter than the phyllodia*.—A very pretty shrub, three to six feet in height. A native of New Holland. Introduced in 1824.

52. *ACACIA SPIROLOBUS* (spire-podded Acacia). Labill. Cal. t. 69. *Unarmed; phyllodia lanceolate, falcate, obtuse, three-nerved, tapering to both ends*.—A shrub, eight feet in height. A native of New Caledonia.

53. *ACACIA PENDULA* (drooping-branched Acacia). *Phyllodia linear, lanceolate, rather arcuate, attenuated at both ends, ending in a somewhat hooked mucrone, having one gland in front at the base, and 2-3 longitudinal nerves*.—This species attains to ten feet in height, and possesses the habit of the weeping willow; its branches are slender and pendulous. A native of New South Wales. Introduced in 1824.

54. *ACACIA DODONÆFOLIA* (Dodonæ-leaved Acacia). Weudl. t. 7. *Phyllodia linear, lanceolate, rather falcate, attenuated at the base, and terminating in a callous, incurved mucrone*.—A shrub, from the eastern coast of New Holland, four to eight feet in height. Introduced 1816.

55. *ACACIA HOMOMALLA* (equal-wooled Acacia). Weudl. Diss. t. 13. *Phyllodia linear, lanceolate, attenuated at both ends, falcate, three-nerved, white on both surfaces, but pubescent at the base; spikes twin, but solitary on the peduncles, axillary*.—A shrub, six to eight feet high. A native of New Holland. Introduced 1822.

56. *ACACIA VERNICIPLUA* (varnish-flowing Acacia). *Phyllodia linear, lan-*

ceolate, two-nerved, falcate, attenuated at the base; heads of flowers globose, axillary, twin.—The young branches of this species are very viscid. It was found growing, four to six feet in height, on rocky hills, near Cox's River, New Holland. Introduced in 1817.

57. *ACACIA FURFURACEA* (scurfy Acacia). *Leaves elliptic or ovate, oblique, ending in an innocuous mucrone, bearing a gland on the upper margin, racemes erect, axillary; legumes covered with white furfuraceous powder*.—A slender plant, two to four feet high, growing on hills, on Gugee-gong River, fifty miles from Bathurst, New Holland. Introduced in 1824.

58. *ACACIA BUXIFOLIA* (box-leaved Acacia). *Phyllodia ovate, acute, bearing a gland on the upper margin*.—A shrub, four to six feet in height, found in pine ranges, at Macquarie River, New Holland. Introduced in 1824.

59. *ACACIA OXYCEDRUS* (sharp-pointed Acacia). Sweet's Fl. Aust. t. 6. *Branches spreading, with cernuous points; leaves rigid, alternate; or in whorls linearly lanceolate; stipules consisting of short rigid spines, about the length of those at the point of the leaf; peduncle clothed with dense wool*.—A very desirable plant for the green-house or conservatory, from the elegance and delightful fragrance of its flowers. It will succeed well in a border by the side of a wall in a southern aspect. It only requires to be protected from severe frosts by a mat, as a slight frost will not hurt it. The best soil is an equal mixture of light sandy loam and peat, the pots to be well drained with small potsherds, that the wet may pass off readily. Young cuttings, planted under bell-glasses, in sand, will readily strike root. Introduced in 1824.

New Holland furnishes us with nearly all the species contained in this section, they are green-house plants and particularly valuable, as flowering for the most part in winter, or early in spring; they are very hardy, and grow freely in loam, peat, and sand, well drained. "Cuttings of most kinds," Sweet observes, "will root pretty freely, if taken from the young wood and planted in sand under a bell-glass and plunged in a little bottom heat. The kinds that do not root readily from cuttings may be increased by taking off roots in as large pieces as can be spared,

and planting them in the same kind of soil as the old plants; when they should be plunged under a hand-glass in a little bottom heat; most of the kinds might be propagated by that means."

Mr. Burchell, who has lately introduced several species from Africa, some of which are rather too tender for the green-house, but are hardy stove plants, and thrive best out of doors in summer, observes, "that the *Acacia* bark of these species abounds to such a degree in tanning principles, as to have become an object of commercial importance, and imparts a reddish colour to the leather;" that he "met little parties of Hottentot women seated in the shade, and busily employed in twisting cord from the *Acacia* bark, while others were chopping down the branches, or stripping off long pieces of it from the stems. Some were engaged in an occupation of a double nature; for, instead of dividing the fibres, by pounding them on a large stone, they performed the operation by chewing, as they fancy the juice to possess an agreeable taste; considering the mode in which it is manufactured, this cord is made very expeditiously. The workwoman being seated on the ground, and having a quantity of prepared bark at hand, spins two yarns at once, by the simple process of rolling them down her thigh with the palm of her hand; and then, by bringing them close together, and rolling them upwards with a turn in the contrary way, they are neatly twisted into a strong single cord;" and that, "from these *Acacias*, large lumps of very good and clear gum, in no point inferior in quality to that produced by the *Acacia vera*, are procured; and, from the myriads which crowd almost every river in Southern Africa, one may feel quite satisfied that there are trees enough to supply a quantity of this drug, more than equal to the whole consumption of Great Britain. The Hottentots use these trees to form large and safe enclosures for their cattle, which, for this purpose, are preferable to every other fence, and beset in every direction with long sharp thorns, equally well prevent their escape, and keep out beasts of prey."—The flowers of a species of the *Acacia* are used by the Chinese in making that yellow, which, we see, bears washing in their silks and stuffs, and appears with so much elegance in their painting on paper. The method is this:—they gather the flow-

ers before they are fully open; these they put into a clean earthen vessel over a gentle heat, and stir them continually about, as they do the tea-leaves, till they become dryish and of a yellowish colour; then, to half a pound of the flowers, they add three spoonfuls of fair water, and, after that, a little more, till there is just enough to hold the flowers incorporated together; this they boil for some time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire and strain it through a piece of coarse silk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyster-shells reduced to a fine powder; all is then mixed together, and this is the fine lasting yellow they have so long used. The dyers of large pieces use the flowers and seeds of the *Acacia* for dyeing three different sorts of yellow. They roast the flowers, as before observed, and then mix the seeds with them, which must be gathered for this purpose when full ripe; by different admixture of these they give the different shades of colour, only for the deepest of all, they add a small portion of Brazil-wood. The *Acacia Julibrissin*, *Acacia acanthocarpa*, *Acacia decurrens*, and *Acacia mollissima*, are the only species that can be considered sufficiently hardy to stand our climate in the open air, and these are liable to be injured in severe winters, unless protected by mats. The handsomest stove species are the *Acacia Houstoni*, *Acacia grandiflora*, and *Acacia speciosa*, but the whole genus is very handsome and easily managed.—See Plates 4, 5, and 7.

ACÆNA (*ANANA*.) a thorn, in reference to the calyx being armed with bristles.

Class 4. 1. Tetrandria Monogynia. *Sanquisorbeæ*, Juss.

Characters are—*Calyx* four-leaved, ovate, concave, equal, permanent; *corolla* four-petalled; *berry* dry, inferior, one-seeded, with *spines bent backwards*.

1. ACÆNA LAPPACEA (Burdock ACÆNA). Ruizet Pav. Fl. per. t. 103. f. 3. *Flowers* racemose, stem erect, leaflets oblong, serrated.—A native of Peru, on the rocks of Tarma, where it grows to about six inches in height.

2. ACÆNA ELONGATA (elongated ACÆNA). *Flowers* disposed in elongated spicate racemes; stems ascending; leaflets oblong, serrated, pubescent beneath.—A shrub, two feet high. A native of Mexico.

3. *ACÆNA LATERBROSA* (dark *Acæna*). Gart. t. 32. *Peduncles scape-formed; stems procumbent; leaflets oblong, cut, hoary beneath.*—From the Cape of Good Hope, where it grows to nine inches in height. Introduced in 1774.

4. *ACÆNA PINNATIFIDA* (pinnatifid-leaved *Acæna*). Bot. Reg. 1271. *Flowers crowded into cylindrical spikes, lower ones rather remote; stem erect; leaves of 3-5 pairs of deeply 3-5 parted leaflets, with the segments linear.*—A half-tender herbaceous plant. A native of Chili, and the Strait of Magellan. It is increased by cuttings of its half-leafy stem, or by division of the roots, or by seeds; during the summer it grows well in the open border, but it will not live there in the winter. Introduced in 1822.

5. *ACÆNA INCISA* (cut-leaved *Acæna*). *Leaves of 6-7 pairs of oblong, cuneated, deeply serrated leaflets.*—This species was found growing at the baths of Collina, Chili, near the limits of the snow, by Mr. M'Rae; it is about seven inches in height.

6. *ACÆNA MYRIOPHYLLA* (myriad-leaved *Acæna*). *Leaves of 7-9 pairs of linear, deeply pinnatifid leaflets; the segments very narrow and silky beneath; fruit ovate.*—A native of Chili, about Mendoza, six inches in height.

7. *ACÆNA SERICEA* (silky *Acæna*). *Flowers connected into globous heads; leaflets obovate, deeply toothed, pubescent, silky on the bark.*—A native of New Spain, at Port Desire, six inches in height.

8. *ACÆNA OVINA* (sheep-fodder *Acæna*). *Plant covered with white hairs; leaflets deeply cut, pinnatifid; segments oblong, obtuse.*—This plant is frequent on the moist lands of Bathurst, New Holland, flowering in June and July.

9. *ACÆNA SANGUISORBÆ* (Burnet *Acæna*). *Spikes globose; leaves remote; leaflets seven pairs, cuneated, serrated, silky beneath.*—A decumbent plant. A native of New Zealand. Introduced 1796.

10. *ACÆNA OVALIFOLIA* (oval-leaved *Acæna*). Ruizet Pav. Fl. per. t. 103. f. c. *Stems creeping; leaves with 4-5 pairs of oblong and somewhat cuneated leaflets, which are villous beneath.*—Found by the celebrated authors of the *Flora Peruviana*, growing in humid shady places Peru. It is a creeping plant, flowering in May and June. Introduced 1802.

11. *ACÆNA ARGENTEA* (silvery *Acæna*). *Spikes globose; stem creeping;*

leaves of 3-4 pairs of ovate, oblong, serrated leaflets, which are silky beneath.—A native of Chili, in bogs and fields, flowering in June. Introduced in 1822.

12. *ACÆNA TRIFIDA* (trifid-leaved *Acæna*). Ruiz. t. 104. f. c. *Spikes globose; stem erect, and are as well as the leaflets covered with canescent tomentum; leaflets 7-8 pairs cuneiforma, 3-5 cleft.*—This species was found growing in pastures, in Chili. It is about one foot in height.

13. *ACÆNA CYLINDRISTACHIA* (cylindrical-spiked *Acæna*). Ruiz. 104. f. 2. *Spike cylindrical; peduncles scape-formed; stems demersed; leaflets 10-11 pairs, oblong, serrated.*—A plant, six inches high. A native of the cold hills of Tarma, Peru.

14. *ACÆNA PUMILA* (dwarf *Acæna*). *Spikes terete; leaflets 11-12 pairs, oval, crenate serrated, quite smooth, shining above.*—This species is about three inches in height. A native of the Straits of Magellan.

15. *ACÆNA LUCIDA* (shining-leaved *Acæna*). *Leaflets 8-9 pairs, 3-5 parted, villous beneath, with the segments linear.*—It is six inches in height, flowering in May and June. A native of the Falkland Islands. Introduced in 1777.

16. *ACÆNA MAGELLANICA* (Magellan *Acæna*). Lam. t. 22. f. 2. *Stem erect, smooth; leaves with six pairs of obovate, deeply serrated trifid leaflets, which are canescent beneath; spikes of flowers globose.*—A native of the Straits of Magellan.

17. *ACÆNA ADSCENDENS* (ascending *Acæna*). *Spikes globose; stems decurrent; leaves with 5-7 pairs of oblong, serrated, smoothish leaflets.*—A native of the Straits of Magellan, flowering in May and June. Introduced in 1822.

18. *ACÆNA SARMENTOSA* (sarmentose *Acæna*). *Stems creeping; leaves of 4-5 pairs of sharply serrated leaflets, which are glabrous and veiny above, but silky beneath; stipules undivided.*—A native of the Island of Tristan d'Acugna.

The species of this genus are small ever-green plants of easy culture, can be increased either by dividing or by seeds. A sandy soil and a dry situation is most suitable for them.—See Pl. 4].

ACALYPHA (Ακαλφη Theophr. and Dioscor. *παρὰ τὸ μὴ ἔχειν καλὴν ἀφὴν*: not being pleasant to handle. Three seeded Mercury or *Acalypha*.

Class 21, 8. *Monœcia Monadelphia*, Nat. Ord. of *Tricoccæ. Euphorbiæ*. Juss.

The characters are—the male flowers are in clusters situated above the female in the same plant. These have no corolla: they have a four-leaved empalement with several short stamina, which are joined at their base, having roundish summits. The female flowers have a large empalement, a three-leaved cup which is permanent: they have no corolla. A roundish germen with three branching styles, and a long stigma. The cup afterwards turns to a capsule with three cells, each containing one roundish seed.

1. ACALYPHA VIRGINICA (three seeded Mercury or Virginian Acalypha). Female flowers have a heart-shaped empalement, and oval spear-shaped leaves, with long foot-stalks.—This sort grows naturally in Virginia and several other parts of North America, from whence I received the seeds. It is an annual plant, which seldom grows more than a foot high, sending out several side branches towards the bottom. The leaves are very like those of the broad-leaved pellitory of the wall, and are placed alternately, having long foot-stalks from the ale, or wings of the leaf. The flowers are produced in small clusters, in July and August. These make but a poor appearance, and resemble those of the pellitory so much, that at a small distance, any person might suppose them to be the same, till convinced by a nearer inspection. If the seeds of this sort are permitted to scatter, the plants will come up in the spring, better than if sown by hand; for if they are not put into the ground in autumn, they rarely grow the first year. All the culture this plant requires, is to keep it clear from weeds, and let it remain where it was sown, for it does not bear removing well. The seeds ripen in October.

2. ACALYPHA VIRGATA (Jamaica Virgate Acalypha). Browne, t. 36. f. 2.—Female flowers with involuere heart-shaped, indented; leaves ovate lanceolate.—Is a native of the warmest countries, and grows plentifully in Jamaica. This is also an annual plant, which in England seldom exceeds the former in stature. The leaves greatly resemble those of the annual nettle, and sting full as much when touched. It is too tender to thrive in the open air in England, therefore the seeds should be sown in pots, plunged into a hot-bed; and if the

plants do not come up the first year, which often happens, the pots should be put under shelter in winter, and the following spring plunged again into a hot-bed, which will bring up the plants: these must be transplanted into other pots, and brought forward in hot-beds, otherwise they will not produce ripe seeds.

3. ACALYPHA INDICA (Indian Acalypha). Rheed. Mal. 10. p. 161. t. 81.—Female flowers with heart-shaped crenated empalements, slightly notched; leaves oval, shorter than the petiole.—Discovered in great plenty by Dr. Houstoun, at La Vera Cruz. It is an inhabitant of marshy places, and grows about three feet high, with an herbaceous stalk. Found also in the East Indies. Introduced in 1759.

[4. ACALYPHA RUBRA (red Acalypha). Involucrum cuneiform-toothed at edge; styles multifid; leaves oblong, subcordate, serrated.—A perennial stove plant, with red flowers. A native of the Mauritius. Introduced in 1820.

5. ACALYPHA CAROLINIANA (Carolina Acalypha). Lam. Ill. t. 789. f. 2. Leaves sub-rhomboid ovate, serrated, entire at base.—An annual, with green flowers. A native of North America. Introduced in 1811.

6. ACALYPHA SCABROSA (rough Acalypha). Flowers diæcious, spiked; leaves oblong, lanceolate, serrated, smooth.—A native of Jamaica, six feet in height. Introduced in 1820.

7. ACALYPHA CUSPIDATA (cuspidate Acalypha). Leaves ovate, cordate, acuminate, serrated.—This species is four feet in height. A native of the Caraccas. Introduced in 1819.

8. ACALYPHA CILIATA (ciliated Acalypha). Spikes axillary, male upwards; female downwards; involucre cordate acuminate, with imbricated serratures, ciliated.—A native of the East Indies, two feet in height. Introduced in 1799.

9. ACALYPHA PAUCIFLORA (few-flowered Acalypha). Female flowers solitary or twin at base of the male spike; involucre cordate, serrate; leaves rhomboid ovate.—An annual, two feet high. Introduced from China in 1816.

10. ACALYPHA BRACHYSTACHYA (short-spiked Acalypha). Female flowers at the base of the male spike without an involucre: leaves roundish, ovate, subcordate serrated.—This species is a na-

tive of China, two feet in height. Introduced in 1816.

11. *ACALYPHA DIVERSIFOLIA* (various-leaved *Acalypha*). *Female flowers twin axillary; involucre entire; leaves ovate, acuminate, serrulate; stem shrubby.*—A native of the Cartaccas.

12. *ACALYPHA INTEGRIFOLIA* (entire-leaved *Acalypha*). *Flowers diœcious; male spiked; female axillary; involucre roundish, entire; leaves smooth, lanceolate, subcordate.*—From the Mauritius, five feet in height, propagated by cuttings. Introduced in 1823.

13. *ACALYPHA HISPIDA* (hispid *Acalypha*). *Spikes axillary, male above, female below; involucre cordate, hispid; leaves ovate, acute, hispid.*—Introduced from the East Indies in 1820, where it grows to three feet in height.

14. *ACALYPHA ALOPECUROIDEA* (fox-tail-like *Acalypha*). Jacq. t. 620. *Female spikes cylindrical, solitary, terminal; involucre five-parted, awned, ciliated; leaves roundish, ovate, acuminate.*—A native of Venezuela, two feet high. Introduced in 1804.

These species require the same treatment as the second, but as they are not very ornamental, they are therefore but seldom cultivated. See Plate 4).

ACANTHUS (ἀκανθός, so called, as some say, from ἀκανθα, a thorn). It is also called *Branca Ursina*, or Bear's breech.

The characters of this plant are—*The empalement is composed of three pair of unequal leaves. The flower is unequal, of one leaf, with a short tube, the beard, or lower lip, being large, plain, and erect. It has no upper lip. The stamina and style occupy the place of it, these are arched and stretched out beyond the empalement. There are two long and two shorter stamina, which closely coalesce to the style, which is situated upon a roundish germen, and afterwards become an oval capsule, having two cells, each containing one fleshy, smooth, oblong seed.*—This genus of plants is by Linnaeus ranged in the second section of his fourteenth class, entitled *Didynamia Angiosperma*, from the flowers having two long and two shorter stamina, and the seeds growing in a cover.

Class 14, 2. *Acanthaceæ*. Juss.

Many of the kinds are very spiny. The species are generally large, with a single herbaceous stalk and great pinnatifid leaves. The flowers are pro-

duced in terminating spikes. Some of the species are shrubby and thorny, with undivided leaves, toothed, and having a thorn at the end of the teeth. These plants were formerly called *Brank-ursine*, from the official name *Branca-ursi*; and also by the vulgar appellation of *Bear's-breech*, from the roughness of the species. But these have now become obsolete; and the softer, more classical name of *Acanthus*, is generally adopted in English.

1. *ACANTHUS MOLLIS* (the common or smooth garden bear's-breech, or *Acanthus*). Lam. Ill. t. 550. *Leaves sinuated, unarmed.*—This species is what is used in medicine and is supposed to be the *Mollis Acanthus* of Virgil. The leaves of this plant are cut upon the capitals of Corinthian pillars. Various have been the disputes among the learned about the plant, which is mentioned under this title by Virgil, who have given so many different characters to it, that no plant yet known will agree with them all. Many, therefore, have been of opinion, that there were two sorts of the *Acanthus*, one of them a tree, and the other an herb. The tree is supposed to be the Egyptian *Acacia*, and the herb the sort here mentioned; but there yet remains a difficulty with regard to some of the epithets applied to that plant, as first, where it is mentioned to be an evergreen berry-bearing plant. *Baccas semper frondentis Acanthus*. As to its being evergreen, that may be easily conceived of our *Acanthus*, in the warm climate of Italy; for, in England, where the plants grow in a warm situation, they are seldom destitute of leaves more than six weeks, unless the winter proves very severe. We may also suppose, that the fleshy oval seed-vessels of this plant might be taken for berries. But then, with regard to its being a twining plant, *flecti tacuisse vimen Acanthi*, it will by no means apply to this, or the *Egyptian Acacia*. However, as the botanists in general have agreed that the plant here mentioned is the *Acanthus* of Virgil, and there being several entire columns of the Corinthian order yet remaining at Rome, upon whose capitals the leaves of this plant are so well expressed, as not to admit of any doubt of their being derived from our *Acanthus*, and these columns being as ancient as the time of Vitruvius, there can be no doubt that

this is the plant from whose leaves Callicmachus, a famous architect, composed the capitals of the Corinthian pillars. The stem of this species is from two to three feet in height. The leaves oblong and shining; the flowers are white and come out from about the middle to the top of the stalk. The roots and leaves abound with a mucilage, which is readily extracted by boiling or infusion. The roots are the most mucilaginous. Where this plant is common, they apply it for the same purposes to which the *marsh mallow*, and other vegetables possessing similar qualities, are applied among us.

2. *ACANTHUS NIGER* (shining-leaved Acanthus, or Portugal bear's-breech). *Leaves sinuated, unarmed, smooth, of a lucid green colour.*—This sort was discovered in Portugal, by Dr. Bernard de Jussieu, from whom I received the seeds in 1725, which succeeded in the Chelsea Garden, and frequently perfects seeds there: which, being sown constantly, produce the same plants as the parent, and therefore must be a distinct species.

3. *ACANTHUS DIOSCORIDIS* (middle bear's-breech Acanthus of Dioscorides). *Leaves lanceolate, entire, having spines on their borders.*—This species is at present very rare in England; it grows naturally in the east, and is by Dr. Linnæus supposed to be the *Acanthus* of *Dioscorides*, but with what certainty I cannot determine. This sort is not so hardy as either of the two former, so requires shelter in the winter; therefore the plants, while young, should be kept in pots, and placed under a common frame during the winter season, where they may enjoy the open air in mild weather, but screened from hard frosts. When the plants have acquired strength, some of them may be turned out of the pots, and planted in a border near a south wall, and in hard frosts, if they are covered with mats or hand-glasses, they may be secured, and these plants will more certainly flower than those in the pots.

4. *ACANTHUS SPINOSUS* (prickly Acanthus). Bot. Mag. 1808. *Leaves pinnatifid spiny.*—The leaves are deeply jagged, in very regular order, and each segment is terminated with a sharp spine, as are also the foot-stalks of the leaves, and the empalement of the flower, which renders it troublesome to handle either of them. Its grows wild

in Italy and Provence. Introduced in 1629.

5. *ACANTHUS ILICIFOLIUS* (shrubby Acanthus), *with prickly leaves like holly.*—This sort grows naturally in both Indies; I received it from the Spanish West Indies. This is an evergreen shrub, rising about four feet high, and dividing into many branches, garnished with leaves, very like those of the common holly, both in size and shape, and are armed with spines in the same manner; the flowers come out singly, they are white, and shaped like those of the common *Acanthus*, but smaller. After the flower is past, the germen becomes an oval bicapsular vessel, having one oblong seed in each cell. It is too tender to thrive out of a stove in England, and can only be propagated by seeds, which do not ripen in Europe. Sweet observes, "it is of easy culture, and strikes freely from cuttings."

6. *ACANTHUS CARDUIFOLIUS* (thistle-leaved Acanthus). *Leaves sinous, toothed, very thorny; spike of flowers, radical.*—The stem is extremely short; many leaves proceed almost immediately from the root, resembling those of the thistle (whence its trivial name), the divisions terminating in a naked spine. The flowers are of a bluish colour. Found by Sparmann at the Cape of Good Hope. Introduced in 1816.

These plants may be propagated by seeds, or parting of their roots; if by the former method, the seeds should be sown in a light dry soil, towards the end of March; if the season proves favourable, the plants will appear in May, and all the culture they require, is to keep them clean from weeds, and where the plants are too close, to thin them, so as to leave them about six inches asunder, which will be room enough for them to grow till autumn, when they should be transplanted where they are designed to remain. The first, second, and third sorts being tender, ought to be planted in a warm border near a wall; and as these do not multiply so fast by their roots, so they do not require more room than three feet; but the fourth sort spreads its roots to a great distance, therefore must have more than twice that room; and being hardy may be planted between two shrubs, to fill up vacant spaces, where it will thrive fast enough, provided the ground be light, and not over wet, and

when the plants are in flower, will make an agreeable variety. If this sort is propagated by its roots, it may be performed either in spring or autumn; but the three first must only be removed in the spring, for if they are transplanted in the autumn, and the following winter should prove cold, they will run the hazard of being lost. These plants take root very deep, so that when they are planted in wet ground, their roots will rot in winter: I have frequently traced them more than four feet, therefore they should not be removed after they have been growing long in a place, but the side shoots may be annually taken off, otherwise they will spread so far, as to overbear any neighbouring plants or shrubs. When they are once established in a garden, they are with difficulty eradicated, for every root which may happen to be left, will shoot again, so as to become troublesome. See Plate 4.

ACER (so called according to Vossius, from *acris*, L. because of the very great hardness of its wood). The maple-tree.

The characters of this tree are,—*The empalement of the flower is monopetalus, coloured, and cut into five sharp segments at the brim, and is permanent. The corolla is composed of five oval petals which spread open, and are larger than the empalement. It hath eight short awl-shaped stamina crowned by simple summits. The germen is compressed, and immersed in the large perforated receptacle. The style is slender, it hath two acuminate stigma, which are reflexed. The capsules are two, joined at their base; they are roundish, each being terminated by a large wing, inclosing one roundish seed in each.*

Class 23, Ord. 1. Polygamia Monœcia, Nat. Ord. triplicate. *Acera* Juss; *Acerineæ* Decand.

1. ACER PSEUDO PLATANUS (great Maple, falsely called Platanus). Eng. Bot. t. 303. *Leaves cordate, five-lobed, glaucous, and smooth beneath; lobes unequally toothed; racemes pendulous; fruit smooth.*—This beautiful tree is remarkably hardy, and will grow with an erect stem to a great height, exposed to the highest winds or to the sea breeze; for both this and *Acer Platanoides* thrive and resist the spray which is blown from the sea, better than most trees usually do, and are therefore very proper to make planta-

tions with near the sea, or to shelter such plantations of trees as are too nearly situate thereto. It is in leaf by the middle of April; and on their first appearance the leaves are of a pleasant green, but they exude a clammy juice so abundantly, that they attract a variety of insects, which soon perforate and disfigure them; when arrived at its full dimensions, it is sixty or seventy feet in height. The variegated sort is also raised from seeds of the same kinds; and most of the plants so raised, will be as finely striped as the old plants from whence the seeds were taken, which is not common to many other variegated plants. It was formerly much planted for walks, but has since given way to more sightly trees. Evelyn complains "that the leaves fall early; putrefy, contaminate, and mar our walks," so that he would "banish it from all curious gardens and avenues." By the interesting experiments of M. Hartig (Grand Master of the Forests of Prussia), on the comparative value of different species of wood as combustibles, this was found to afford more heat than any other wood of the North of Europe.

2. ACER CAMPESTRE (common or small maple). Eng. Bot. 304. *Leaves cordate, bluntly five-lobed, shining, smooth beneath; lobes nearly cut; corymbs erect; wing of fruit divaricated.*—The common maple is too well known to need any very particular account, it growing frequently in hedge rows in most parts of England, and forms a very picturesque little tree; and the timber is far superior to that of the beech or the sycamore for all the uses of the turner, particularly dishes, cups, trenchers, and bowls; and when it abounds with knots (as it very often does), it is highly esteemed by the joiners for inlayings, &c., and also for the lightness of the wood; it is often employed by those that make musical instruments, and for the whiteness of its wood it was formerly in great request for tables, &c. It is also frequently substituted for that of the holly and box, by the mathematical instrument maker. We meet with high encomiums on the wood of this tree among the ancients; and Virgil introduces Evander sitting on a maple throne. It was chiefly valued among the Romans for the firmness of its grain. They are said to have set an

exorbitant value upon their tables of *maple* wood, according to their size and the beauty of their veins. The principal value of this tree now is, for underwood; it is of quick growth, and affords good fuel.

3. ACER NEGUNDO (Virginian ash-leaved maple). Mich. t. 46. *Leaves ternate and pinnate, cut, serrate; male flowers corymbose; female racemose.*—The *ash-leaved maple* is a very strong shooting tree, and is, in Virginia, one of the largest trees of this kind. It must be planted in places not too much exposed to violent winds, being subject to split thereby. This tree ripens seeds very well in England, by which means it is easily propagated, or by cuttings planted in autumn. [Michaux observes, that of all the *maples* of the United States, this species ventures least into northern latitudes. West of the mountains, on the contrary, it is extremely multiplied, in bottoms which skirt the rivers, where the soil is deep, fertile, constantly moist, and often inundated, this tree is most abundant, here it attains to about fifty feet in height, and twenty inches in diameter. It expands into a head like that of the *apple-tree*. It would afford a profitable product in its sprouts (which are very numerous, and which during the first years shoot with astonishing rapidity), if planted on grounds unfailingly moist and cool. In America it is called the *box elder* or *black ash*.] It was cultivated in 1668, by Bishop Compton.

4. ACER PLATANOIDES (Norway maple with plane tree leaves). *Leaves, cordate, five-fid, smooth; segments acuminate, cuspidate, somewhat toothed; corymbs nearly erect.*—The *Norway maple* has a milky sharp juice, so that few insects care to prey thereon, by which means the leaves are seldom eaten or defaced; and being smooth, and of a shining green, they have a much better appearance than those of the *sycamore*; and in the spring, when the flowers are out, have great beauty. This tree is also raised by seeds, of which it affords great quantities, which rise and grow from the scattered seeds as well as the common sort; it will also grow from cuttings, if they are planted in the autumn. The variegated kind may also be propagated by inoculating a bud of the striped kind into one of the plain sort, though I am

not at present sure whether it will take upon any other sort of *maple*, not having made the experiment; but I believe it can scarce fail. Most, if not all the other sort of *maples*, take very well upon each other. [*Acer Platanoides* grows on the mountains of the northern counties of Europe, descending in some places of Norway to the sea-shore. It abounds in the North of Poland and Lithuania, and is common through Germany, Switzerland, and Savoy. On a tolerable soil it attains a large size. Hanbury observes, "that in the autumn the leaves die to a golden yellow colour, which produces a good effect at that season, when the different suits of the decaying vegetable world are displayed." He says further, "that it is a quick growing tree, arrives at a great bulk, and is one of the best trees for sheltering habitations." Linnæus recommends it for sheltering walks and plantations; as yielding a juice from which sugar may be made, if it is wounded in the winter: and as cutting out into a white smooth wood, fit for the stocks of guns, the joiner and the turner. There are two varieties of this tree, one with variegated leaves, the other with the lobes of the leaves deeply jagged, with acuminate bristle-like teeth. The bark of it is gray with white spots].

5. ACER RUBRUM (scarlet-flowering maple of Virginia). Mich. t. 14. *Leaves on long stalks, sub-cordate, five-fid, smooth, glaucous beneath; segments acuminate, cut, toothed; umbels erect.*—The *Virginian flowering maple* was raised from seeds which were brought from Virginia many years since, by Mr. John Tradescout, in his garden at South Lambeth, near Vauxhall, and since in the gardens of the Bishop of London, at Fulham, where the trees have flowered for several years and produced ripe seeds, from which several trees have been raised. It may be also propagated by laying down the young branches early in the spring, giving them a little slit at a joint, by which means they will have taken sufficient root in two years, to be transplanted elsewhere. They require a situation a little defended from the north-east winds, especially while young; and delight in a moist light soil, in which they thrive much better than in a dry ground, and will produce more flowers, and better seeds. This tree

commonly flowers in the beginning of April, and the seeds are ripe in five or six weeks after, at which time they should be sowed; for they are very apt to perish, if kept long out of the ground. There is a variety of the *flowering maple*, which was sent from America to Sir Charles Wager, and flourished several years in his garden at Parson's Green, near Fulham. This is by the gardeners titled Sir Charles Wager's *Flowering Maple*. The flowers of this kind come out in large clustres, and surround the younger branches, so as to appear at a small distance covered with them. It is now become pretty common in some of the nurseries near London, so that the former sort is not so much esteemed, being less beautiful; but it is doubtful if they are distinct species. [The *red flowering maple* is the earliest tree whose bloom announces the return of spring, to the North American; it is in flower near New York from the 10th to the 15th of April. The blossoms of a beautiful purple or deep red, unfold more than a fortnight before the leaves. Its wood is harder than that of the *white maple*, and of a finer and closer grain, and acquires by polishing a glossy and silken surface. Before mahogany become generally fashionable, the most beautiful furniture was made from it. The Canadians tap the tree for the juice, of which they make sugar and treacle, and with the bark they die a dark blue, and make a good black ink. It is generally about twenty feet in height, and was introduced in 1656].

6. *ACER SACCHARINUM* (American sugar maple). Mich. t. 16. *Leaves subcordate, acutely five-lobed, downy beneath; lobes nearly entire; corymbs before the leaves, loose, nodding.*—The *American sugar maple* has some resemblance to the Norway, when the plants are young; but, as they grow up, the leaves are more deeply divided, and their surfaces less smooth, so that they are then easily distinguished. From this tree the inhabitants of North America make a very good sort of sugar, in large quantities, by tapping the trees early in the spring, and boiling the juice, which is drawn out till the fæces subside, is the sugar: but, I am of opinion, that the people make sugar from more than one sort of *maple* in America, for I have found that the *ash-leaved maple* abounds

with a saccharine juice, in full as great plenty as any other sort. Mr. Ray and Dr. Lester, prepared a tolerable good sort of sugar from our *greater maple* by tapping some of the trees in their bleeding season; and, I have observed, upon cutting off branches from the *scarlet maple* in February, a great quantity of a very sweet juice has flowed out for several days together. [The extraction of sugar from the *maple* is a valuable resource in a country, where all classes of society daily make use of tea and coffee. The sugar prepared from the sap of this tree is equal to any other sugar, and procured with little trouble. The process by which it is obtained is very simple, and is every where nearly the same. The work is commonly taken in hand in the month of February, or in the beginning of March, while the cold continues intense, and the ground is still covered with snow. The sap begins to be in motion at this season, two months before the general revival of vegetation. A hole is made in the tree, eighteen or twenty inches from the ground, in an ascending direction, with an auger and a spout (generally of *sumach* or *elder*) is introduced about half an inch, which projects from four to twelve inches. The sap will flow six weeks, if the temperature of the weather be favourable. Troughs, large enough to contain three or four gallons, are placed under the spouts to receive the sap, which is carried every day to a large receiver, from which it is conveyed (after being strained) to the boiler; if it be likely to boil over a bit of lard or butter thrown into it will immediately calm the ebullition. In order to ascertain when the evaporation has continued long enough, it is usual to rub a drop of the syrup between the fingers; and, if by so doing it becomes granular, the operation is perfect. Lime, eggs, or new milk, is added to the sap in order to clarify it, but clear sugar may be made without any of these ingredients. The sugar, after being sufficiently boiled, is grained, clayed, and refined in the same manner as the cane sugar in the West Indies. The sooner the sap is boiled, after it is drawn from the tree the better; it should never be kept longer than twenty-four hours. The larger the quantity boiled at once, the more sugar, in proportion, will be produced. The quality of ma-

ple sugar is superior to that which is made in the West Indies from the cane, and it deposits less sediment when dissolved in water. It has something of the appearance of sugar-candy. After three or four days' exposure to the sun, maple sap is converted into vinegar by the acetous fermentation. It is observed that some trees yield as much as two or three gallons of juice in twenty-four hours. Three persons are found sufficient to attend two hundred and fifty trees, which give one thousand pounds of sugar, or four pounds from each tree; but this product is not uniform, for sometimes not more than two pounds are obtained from a tree. Four active men, well provided with materials and conveniences, may make in a common season (which lasts from four to six weeks), forty hundred-weight of good sugar. It is calculated that more than ten million pounds of maple sugar is annually made in the United States alone. The Indians of Canada have practised the making of sugar from the maple time out of mind, and they gain one pound of sugar from eight pints of juice. A very pleasant and salutary drink is obtained by adding one quart of maple molasses to four gallons of boiling water; with a little yeast or leaven to excite the fermentation, and a spoonful of the essence of spruce. Michaux states that "the ashes of the *sugar maple* are rich in the alkaline principle, and it may be confidently asserted, that they furnish four-fifths of the potash exported to Europe from Boston and New York." We are assured by Dr. Rush, that this tree is so far from being injured by tapping, that it yields the more sap the oftener it is tapped; and that a tree flourished after forty-two annual operations.]

7. *ACER PENSYLVANICUM* (the mountain maple of Pennsylvania). Duham. Arb. t. 12, 13. f. 11. *Leaves three-lobed, acuminate, sharply double serrate; racemes simple; calyxes smooth.*—This species attains, in some situations, to about fifteen feet in height, with a slender stem, covered with a whitish bark, and sending forth several red branches. The flowers are on long pendulous racemes, of a greenish yellow colour. The thickness of the shade, the beauty of the bark (and the tree, not being liable to insects), would make it desirable for plantations, were it not for the litter

occasioned by the abundance of the leaves and fruit which it produces, and its being subject to be torn by storms.

8. *ACER OPALUS* (Italian maple) *Leaves on long stalks, round, coriaceous, bluntly five-lobed, pale beneath; lobes bluntly, toothed; corymbs erect; fruit smooth.*—This sort of maple is very common in most parts of Italy, but particularly about Rome, where it is one of the largest trees of that country, growing to the height of fifty feet or upwards, and is esteemed for the size of the leaves, which are large, affording a great shade; on which account they are frequently planted by the sides of roads, and near habitations. In England this tree is very rarely to be met with, though it is hardy enough to bear the open air; but, as the seeds have not been brought over to England till lately, there are no large plants in the English gardens at present. Introduced in 1752.

9. *ACER MONSPEULANUM* (the Montpellier maple). *Leaves three-lobed, very entire, annual; lobes equal; corymbs few-flowered, erect.*—Is common in the South of France and Italy, where it grows to twenty feet in height; the leaves resemble those of the common maple, but are of a much thicker substance, though not so large, and are of a shining green colour. They continue in verdure very late in the autumn, which renders them the more valuable. At present this sort is not common in England. I raised several plants from seeds, some of which have for several years produced good seeds in the Chelsea Garden, where from the scattered seeds the plants come up annually in plenty. Introduced in 1739.

10. *ACER CRETICA* (Cretan maple). *Leaves three-lobed, somewhat hairy on their under side; lateral lobe shortest; corymbs few-flowered, erect.*—This species bears some resemblance to the last. The leaves of this sort are of a much thinner texture, and their foot-stalks are covered with a soft hairy down, whereas those of the *Acer Monspeulanum* are smooth and stiff. This sort grows naturally in the Levant, from whence it was introduced in the year 1752.

11. *ACER HETEROPHYLLUM* (evergreen maple). *Leaves evergreen, ovate, entire, three-lobed, obsoletely toothed, smooth.* A very small shrub, seldom

attaining to more than five feet in height, with greenish-yellow flowers. A native of the Levant. Introduced in 1759.

12. *ACER BARBATUM* (bearded maple). *Leaves shortly three-lobed, serrated, smooth on each side*—A tree twenty feet in height, growing in humid pine-barrens, extending from New York to Carolina. Introduced in 1812.

13. *ACER OBTUSATUM* (blunt-leaved maple). *Leaves cordate, bluntly five-lobed, downy beneath*.—An ornamental shrub, growing to the height of about nine feet in Hungary, where it is indigenous. Introduced in 1825.

14. *ACER STERCULIACEUM* (sterculia-like maple). Wall. Pl. t. 105. *Leaves cordate, puberulous beneath, five-lobed; lobes ovate, acuminate, serrate; outer ones very short, and quite entire; racemes smooth*.—We are informed by Dr. Wallich, that this maple is a native of Nipoul, on the top of Mount Sheopore, where it attains to the height of fifty feet, with a diameter of three feet.

15. *ACER LÆVIGATUM* (smooth-leaved maple). Wall. t. 104. *Leaves oblong, acuminate, serrulate, smooth; corymbs terminal; petals wedge-formed*.—This species is only known to us by the account of it in Dr. Wallich's valuable work above quoted, where we are informed that "it is a noble forest tree, growing to a gigantic size on high mountains in Nepal."

16. *ACER ERIQCARPUM* (white maple). Mich. t. 40. *Leaves opposite, five-lobed, unequally and deeply toothed; flowers apetalous, pentandrous*.—This species is found in great abundance, growing to the height of forty feet, on the banks of the Ohio, and such rivers only as have limpid waters and a gravelly bed, and never in swamps inclosed in forests, where the soil is black and miry, which is almost exclusively the situations where the red maple (which has sometimes been confounded with this) is found. It blooms early in spring, and the wood is very white and of a fine grain, but it is softer and lighter than that of the other species in the United States. Sugar is procured from its sap, but it yields only half the product from a given measure of sap; but the unrefined sugar is whiter and more agreeable to the taste than that of the *saccharinum*. In forming plantations, care should be paid to the choice of the

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ground, which should be constantly moist. In such a situation its vegetation is surprisingly beautiful and rapid. Introduced in 1725.

17. *ACER STRIATUM* (moose-wood maple). Mitch. t. 45. *Leaves cordate, three-fid acuminate, serrated smooth; racemes simple, long, pendulous; branches striated*.—This is one of the earliest trees of North America, whose vegetation announces the approach of the genial season. Its buds and leaves, when beginning to unfold, are rose-coloured, and have a pleasing effect, but this hue soon changes to green. This species of maple has been long cultivated in Europe in parks and extensive gardens. It is in request on account of the pleasing effect of the white veins which variegates its trunk. In the primitive forests, where it grows beneath a canopy of impervious shade, these veins are black: the change of colour seems owing to its being planted in drier soils and more exposed to the sun. The trunk and branches of the *moose-wood* are clad in a smooth green bark, longitudinally marked with black stripes, by which it is easily distinguishable at all seasons of the year. The name *moose-wood* was given it by the first settlers, from observing that the moose subsisted during the latter part of winter and the beginning of spring upon its young twigs. Most of the trees of this species, which now grow in Europe, have been grafted on the lofty *sycamore*, whose vigour is felt by the *moose-wood*, and expands it to four times its natural dimensions, which rarely exceed fifteen or twenty feet in height. Introduced in 1755.

18. *ACER NIGRUM* (black sugar maple). Mich. t. 43. *Leaves cordate, five-lobed, margin entire, downy beneath; corymbs sessile, nodding; fruit smooth*.—This tree forms a large part of the forests of Genesee, and covers the immense valleys, through which flow the great rivers of the west. When the *black sugar tree* stands alone, it assumes a regular and agreeable shape. Its foliage, of a darker tint and more tufted than that of the other maples, renders it proper for forming avenues, and for adorning parks and gardens, where thick shade is desired as a shelter from the sun. The wood is much like that of the other species, but it is coarser grained, and less brilliant when po-

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lished. Its most important use in the United States is for making sugar, of which it annually yields a vast amount, in the neighbourhood of Pittsburgh. Introduced in 1812.

19. *ACER MONTANUM* (mountain maple). Mich. t. 47. *Leaves about five-lobed, acuminate, serrated, downy beneath; racemes spike-formed, sub-erect; petals linear.*—This species is abundant in Canada, and along the whole range of the Alleghany Mountains. It appears to have a preference for the declivities of mountains exposed to the north, and in cool, moist, shady situations, on the abrupt and rocky banks of torrents and rivers. On the Mohawk it abounds among the enormous rocks which lie scattered along its sides. The *mountain maple* is six or eight feet in height, and it blooms even at a smaller elevation. It most frequently grows in the form of a shrub, with a single and straight stock, and is commonly grafted on the *sycamore*, like, the *moose-wood*, and is thus increased to twice its natural dimensions. This surprising development proves what great advantage may be derived from this process and from continued cultivation, in meliorating inferior vegetables. Introduced in 1750.

20. *ACER VILLOSUM* (shaggy maple). Wall. Pl. rar. 2. p. 4. *Leaves cordate, five-lobed, lobes ovate, acute; racemes lateral.*—A native of the high Alps approaching towards those of perpetual snow in Sirmore and Kamaon.

21. *ACER CULTRATUM* (cultrate-winged fruited maple). *Leaves cordate, seven-lobed, lobes acuminate entire; petals wedge-shaped.*—A native of the regions towards the Cimatpya in Kamaon and Srinaghur.

22. *ACER LOBELLI* (Lobel's maple). *Leaves slightly heart-shaped, five-lobed.*—This species is a native of the mountains of Naples, where it grows to a considerable size, very straight, and has a pyramidal head.

23. *ACER CAUDATUM* (long-pointed maple). *Leaves cordate, five-lobed; lobes ovate, acuminate, doubly serrated; racemes smooth; wings and fruit diverging.*—This is an East Indian species, for a knowledge of which we are also indebted to the researches of Dr. Wallich, who describe it as a native of the highest regions of Nepaul towards Gossainthan, &c.

24. *ACER SPICATUM* (spike-flowered maple). *Leaves oblong, heart-shaped, five-lobed.* This species is a native of the mountains in Canada and the United States. In this country it is principally found in the plantations of the curious.

25. *ACER TATARICUM* (Tartarian maple). Pallas. Ross. t. 3. *Leaves heart-shaped, undivided serrate, lobes obscure; flowers in racemes.*—Linnaeus describes this as a lofty shrub, or rather a low tree, not exceeding twenty feet in height, with leaves like those of *horn-beam*. The wood is whitish, with some brownish veins. Pallas informs us, the seeds are used as astringents by the Calmuc Tartars, boiled with milk and butter. The *Tartarian maple* is very hardy in respect to cold, yet very difficult to raise in England; for when the plants are young, if they are exposed to the sun but a few hours, they will be destroyed: and though the trees naturally grow on boggy grounds, yet watering the young plants much will kill them. The only method to preserve them is to cover the surface of the ground with moss, which should be kept moist, and the plants entirely shaded from the sun the first summer. Introduced in 1759.

26. *ACER PALMATUM* (palmate-leaved maple). *Leaves palmately divided into 5-7 lanceolate, acute, equal lobes.*—It is a small tree flowering in May. Introduced in 1820.

27. *ACER DISSECTUM* (dissected-leaved maple). *Leaves many parted, opposite smooth; lobes pinnatifid lanceolate, serrated.*—A tree with spreading branches growing near the River Oroawa.

28. *ACER PICTUM* (painted-leaved maple). *Leaves seven-lobed, seven-nerved, variegated with white; lobes acuminate, entire.*—A small tree with ash-coloured branches.

29. *ACER TRIFIDUM* (trifid-leaved maple). *Twigs smooth, purplish; leaves undivided, trifid entire.*

30. *ACER SEPTEMLOBEM* (seven-lobed maple). *Leaves seven-lobed, smooth; lobes acuminate, equally and acutely serrated.*

31. *ACER JAPONICUM* (Japan-maple). *Leaves villous many parted; lobes thirteen parted serrated; umbels simple many flowered; branches smooth and purplish.*—We are informed by Thunberg, in his *Flora Japonica*, that "for beauty

nothing could excel the *maples* (*Acer palmatum*, *dissectum*, *pictum*, *trifidum*, *sepiemlobem*, *Japonicum*), indigenous to that country; and that at Faconia and at other places they are much cultivated. They were just then (May) beginning to put forth their blossoms," and he states that he purchased several at a great expense, and sent them to the Medical Garden at Amsterdam. Since that period some of the species have been introduced into this country.]

The genus *Acer* consists of deciduous trees, most of them sufficiently hardy. They are easily propagated by sowing their seeds soon after they are ripe, in a bed of common earth, covering them about half an inch thick with light mould. In the spring they will appear above ground, and if kept clear from weeds, and watered in dry weather, some of the sorts will grow above a foot high the first summer. The autumn or spring following (if they are close in the seed-bed) it will be proper to transplant them into a nursery, in rows at three feet distance, and two feet asunder in the rows. They may remain three or four years, by which time they will be large enough to plant out for continuance. If the seeds of any of the sorts of *maple* are kept out of the ground till spring, they rarely come up the same year, so that the surest method of raising them is, to sow the seeds as soon as possible after they are ripe; and if they are to be transported to any distance, it will be proper to put them up in sand or earth. Most of the sorts of *maple* which come from America, are very impatient of heat while young; their seeds therefore should be sown in a sheltered situation, for if the plants are exposed to the sun but one day when they first appear, few of them will survive it, especially of the *sugar maple*, of which, I always lost the greater number of plants, till I took the precaution to place the pots in which the seeds were sown, entirely in the shade; for no sooner are they exposed to the sun than they are attacked by insects, which in one day will devour their seed-leaves, after which the plants suddenly drop to the ground. This precaution therefore is necessary to be observed, in raising them from seeds. Trees raised from seed will grow faster and attain a greater height than those from layers or cut-

tings; by which means they may also be propagated, but this is seldom practiced in those sorts which come readily from the seed. Sweet states that "they root better by being planted early in autumn, than in spring, the time usually selected." The ground should be well fastened round them to prevent injury from worms and frost. For budding, the variegated or striped sorts; let some common plants of the same species, one year old, be taken out of the seminary, and set in the nursery in rows a yard asunder, and a foot and a half distant from each other. Let the ground be kept clean, and in the winter turned over: the summer following, the stocks will be of a proper size to receive the buds, which should be taken from the most beautifully striped branches. The best time for this work is August. The eyes or buds should front the north. Early in October take off the bass matting, then cut off the stock just above the bud, and dig the ground between the rows. The summer following cut off all natural side buds from the stock; and, by autumn, if the land is good, your buds will have shot forth, and formed themselves into trees five or six feet high. They may then be removed, or a few only drawn out, leaving the others to be trained up for larger standards. It is in our hedge-rows principally that we find the *common maple*, as it is seldom, if ever allowed the honour of mingling its shade with those that compose our British shrubbery; although, according to Chaucer, it formed the bower of the fair Rosamond de Clifford. The *common*, *sugar*, *Norway*, and *ash-leaved maples*, being large growing trees, forty feet high and upwards, with spreading heads, and exuberant foliage, are fit for plantations; and the leaves being of different sizes, shapes, and colours, they will make a considerable variety, especially if we take in the variegated sorts. And the large pendulous branches of flowers, though deficient in colour, are not without their beauty, particularly those of the *Norway maples*. The other sorts are of inferior growth, seldom rising more than from twenty to thirty feet. The *Acer pseudo-platanus* is supposed to grow better near the sea than in any other situation, and that a plantation of these trees at fifty feet asunder, with three *sea shallow thorns* betwixt every two of

them, would make a fence sufficient to defend the herbage of the country from the injurious tendency of the sea spray. We are informed by Dr. Lindley that the *Acer macrophyllum* (which is probably the finest of the genus), "has been recently procured in a living state by the Horticultural Society, from the north-west coast of North America, where it forms a very large tree, having a dense umbrageous head, and yielding a timber of apparently considerable value, and that some of the leaves on young vigorous shoots have measured as much as ten inches in diameter." The largest maple-tree in England is in the church-yard of Boldre, in Hampshire, under whose branches the Rev. William Gilpin, author of *Remarks on Forest Scenery, &c.*, lies buried. See Plates 4, 6, and 8.

ACERAS (From *a* without and *keras* a horn), in allusion to the absence of the spur from the *labellum*, by which character it is principally distinguished from *Orchis*.

Characters are,—*Flowers ringent. Lip without a spur. Glands of the pollen masses included in a common pouch.*

Class 20, 1. Gynandria monandria. Nat. ord. *orchideæ*.

ACERAS ANTHROPOPHORA (green man Aceras). Eng. Bot. t. 29. *Lip the length of ovary*.—This species is rather singular than strikingly beautiful in appearance, and chiefly remarkable for the figure of a naked man represented by the lip of its flower; the brownish petals forming a kind of cap or helmet, to the figure. Columna claims the honour of being the first who has mentioned it. It has ever since been much celebrated, and Linnæus tells us, every body who was curious in plants, when he was at Paris, went from thence to Fontainebleau to see it in flower, the neighbourhood of that place abounding with the species. It is difficult to cultivate, and can only be propagated by seeds, which thrive best in a mixture of sand, loam, and chalk.

ACETOSA (of *acetous*, and *aire*, *sour*). The *sorrels* are by Linnæus joined to the genus of *dock*, under the title of *Rumex*; but, as all the known species of *sorrel* have male flowers growing upon distinct roots from the female, therefore by his method they should be ranged in his twenty-second class *Diacia*; therefore I have taken the liberty

to separate them from the *docks*, rather to preserve their old title, as the plants have been long used both in the kitchen and shops.

The Characters are,—*It hath male and female flowers in different plants; the male flowers have a three-leaved empalement, in which are included six stamina, crowned with flat oblong summits but have no corolla; the female flowers have also a three-leaved empalement, in the centre of which is situated a three-cornered germen, supporting a trifid styles. The germen afterward turns to a triangular seed.*

1. ACETOSA PRATENSIS (common or meadow sorrel). Eng. Bot. 127. *Leaves sagittate*.—This sort, though but small in the fields, yet, when sown in gardens, will produce fair large leaves; this is commonly cultivated in gardens. It must be sown early in the spring, in a shady moist border; and, if the plants are afterward removed into another shady border, at the distance of four or six inches square, they will produce larger leaves, and continue longer. This is the *common sorrel* used in medicine. A common inhabitant of meadows and pastures throughout this island, in almost all soils and situations, flowering in June. The whole herb is acid, with a degree of astringency, not unpleasant nor unwholesome, agreeing much with the different species of *rhubarb*, to which it is nearly allied. The leaves are eaten in sauces and salads. The Laplanders use them to turn their milk sour. In France they are cultivated for the use of the table, being introduced into their soups, ragouts, and fricasees. In some parts of Ireland they eat them plentifully with milk, alternately biting and sipping. The Irish also eat them with fish and other alcalescent food. The dried root gives out a beautiful red colour when broiled. Horses, cows, goats, sheep, and swine, eat it.

2. ACETOSA ACETOSILLA (common sheep's sorrel). Eng. Bot. 1674. *Leaves lanceolate, hastate*.—The *sheep's sorrel* is a common weed in most parts of England, growing upon dry banks and in gravelly soils in great plenty; for, as it propagates very fast by its creeping roots, so wherever it once gets possession in the ground, it soon multiplies. This is rarely admitted to have a place in gardens, but as it has long been continued in the dispensaries as a medi-

nal plant it is here inserted. It is less by half than the *common sorrel*. Haller observes "that it ascends into the high Alps, and then becomes very small, and that it is often found growing in coal-yards, and is a sure indication of a dry barren soil."

3. *ACETOSA SCUTATUS* (round-leaved or French sorrel). *Leaves cordate, hastate*.—The *round-leaved* or *French sorrel*, is a more grateful acid, so by many persons is preferred to the other two sorts for kitchen use; this is also a medicinal plant, and should not be wanting in any good garden: it is a great runner at the root, by which means it is easily propagated, and the roots planted at the distance of two feet square at least: it will agree better with an open situation than the other two sorts. And if the flower-stems and rambling branches are cut off in the beginning of July, the roots will soon put out new leaves, which will be tender and much better for kitchen uses, than the older leaves; so that by cutting down the shoots of some plants at different times, there will always be a supply of young leaves, which is the only part of the plant used in the kitchen. And this sort is much preferable to the *common sorrel* for soups, so many persons have of late years cultivated it in their gardens, since the use of *sorrel* has been greatly increased in England, by the introduction of French cookery, it being an ingredient in many of their sauces and soups. Insomuch that about Paris, *sorrel* is cultivated in as great quantity as almost any other esculent plant. A native of Germany, Switzerland, Italy, the south of France, and Barbary. Introduced here in 1596.

4. *ACETOSA DIGYNUS* (low creeping sorrel). *Leaves round, indented; flowers hermaphrodite; valves entire, ovate*.—The *low creeping northern sorrel*, is preserved in many gardens for the sake of variety but has not yet been used in the kitchen. It grows wild in most of the northern counties, as also in Wales. I have seen it growing in great plenty in Yorkshire and Westmoreland. The leaves of this sort have very short foot-stalks, and are indented at both ends. These grow near to the ground, and the flower-stems rarely rise above six inches high. The roots creep in the ground, whereby it multiplies exceedingly in a proper situation. As this sort grows naturally in shady moist

places, so whoever is desirous to have it thrive in a garden, must plant it in a north border and in a moist soil, where it may be propagated with ease, and be used for the same purposes as the others.

5. *ACETOSA ALPINA* (Alpine sorrel). *Leaves cordate, acuminate, heart-shaped, embracing the stalks*.—The *Alpine sorrel* is full as hardy as the *common*, and as the leaves are much larger, so they are better for the uses of the kitchen, having as pleasant an acid taste, and being much more succulent. It has the air, stature, and size of *rhubarb*, with nearly the same qualities in a less degree; a double dose at least must be taken to produce the same effect. This may be propagated either by seeds, or parting of their roots, in the same manner as the *common* sort, but the plants require more room, for which reason they ought not to be nearer than a foot from each other, especially in good ground. Introduced 1599.

6. *ACETOSA LUNARIA* (sorrel tree). *Leaves cordate, heart-shaped, roundish; stems shrubby*.—The *sorrel* tree rises with a woody stalk, ten or twelve feet high, covered with a smooth brown bark, and sending out many branches. The flowers grow in loose spikes at the end of the branches: it flowers in June and July. A native of the Canary Islands. Introduced 1698.

7. *ACETOSA ROSEA* (rose sorrel from Egypt). *Leaves eroded; wing of valves very large, membranaceous, declining*.—This is an annual plant, rising a foot and a half high, and dividing at top into several branches; the flowers are disposed in loose spikes; the seeds are inclosed in large inflated covers of a deep red colour. Dr. Sibthorpe found it in the Isle of Cyprus, and his fine figure is the only good one we have met with.

8. *ACETOSA STERILIS* (Northern barren sorrel). *Leaves oblong*.—The *northern barren sorrel* is preferred to the *Acetosa pratensis* in the kitchen-garden, because it rarely runs to seed, but is increased by parting the roots either in spring or autumn, and is fit for use all the year.—See Plate.

ACHANIA (Ἀχάνη), *non hians*; because the *corolla* does not open out, but remains rolled together.

Class 16. 6. Monadelphia Polyandria. Nat. Ord. *Columifera*, *Malvaceæ*. Juss.

Characters are—*Calyx double; outer many leaved; corolla convolute; berry five-celled, five-seeded*.

1. *ACHANIA MALVIVISCUS* (scarlet Achania). Bot. Mag. 2305. *Leaves cordate, 3-5 lobed acuminate, roughish; leaflets of involucre, erect.*—The seeds of this species were sent me from the Cape of Good Hope, a few years past. It is an annual plant, with strong hairy branching stalks, garnished with broad leaves; the lower being divided into three, and the upper into five obtuse lobes, which are crenated on their edges; the flowers are large, of a pale colour, and continue through the greater part of the year. It has maintained the same appearance these ten years, so that there is no doubt of its being a distinct species. A native of Mexico and Jamaica. Introduced in 1714.

ACHANIA MOLLIS (woolly Achania). Bot. Reg. 11. *Leaves cordate, about three-lobed, acuminate soft, downy; Leaflets of involucre, somewhat spreading.*—This species is a native of South America, and the West Indian islands. Houstoun found it in Jamaica, where it flowers in August and September. It grows in a large wide spreading way, so as to take up much room. Introduced in 1780. A variety of this species is often found in our gardens with ovate, oblong, acuminate, undivided leaves.

3. *ACHANIA PILOSA* (hairy Achania). Bot. Cab. 829. *Leaves cordate, crenate, blunt, or acuminate; branches and petioles hairy.*—This species has a very different appearance from the two former. It is shrubby as they are, but the stem and branches, are, smaller, thinner and not downy, and it continues only two or three years. "It is raised from seeds, and flowers in October, and forms a very pretty little plant." It requires to be constantly preserved in the stove.

Achania is generally propagated by cuttings, because the seeds do not ripen here; if the cuttings are planted in pots filled with light earth, and plunged into a gentle hot-bed, keeping the air from them, they will soon take root, and should be gradually inured to bear the open air. These plants require a moderate stove to preserve them through the winter; and if they are kept in warmth in summer, they will flower, and sometimes ripen fruit: they may be placed abroad in a sheltered situation for two or three months, but the plants so treated seldom flower well. [Sweet recommends that, "the cuttings should be taken off as near the stem of

the plant as possible, these not being so apt to rot as when taken off by the middle of the shoot. None of the leaves should be taken off above the sand."]

ACHILLEA (so named from Achilles, the famous Grecian hero, who is supposed to have imbibed the knowledge of botany from his master Chiron). Milfoil, yarrow, or nosebleed.

Class 19. 2. Syngenesia Polygamia Superflua. Nat. Ord. of *Compositæ Discoideæ*—*Corymbifera* Juss. Raii.

The Characters are,—*It hath a compound radiated flower, consisting of many tubulous florets, which are hermaphrodite, and compose the disk of the flower; the female flowers are ranged round the border; these have their corolla stretched out on one side like a tongue, which compose the rays, all included in one common scaly empalement. The hermaphrodite flowers have each five short slender stamens, accompanying a small germen, which is situated in the bottom, and rests upon a downy bed; the germen afterwards becomes a single oval seed, having a down adhering to it.*

1. *ACHILLEA MILLEFOLIUM* (common yarrow). Eng. Bot. 758. *Leaves bipinnate, their segments linear, toothed.*—This sort is the common yarrow, or milfoil, which grows naturally on banks, and by the sides of foot-paths, in most parts of England, but is rarely allowed a place in gardens: yet, being an official plant, it is here mentioned to introduce the other. Its blossoms are usually white, but some are found of different shades from a pale to a deep red, and there is a variety with purple flowers which is frequently found wild in England, but the plants seldom continue to produce purple flowers long when they are transplanted into gardens. The yarrow creeps greatly by its roots, and also multiplies by its seeds, so that it becomes a troublesome weed where it is permitted to grow. [Agriculturists are not agreed whether to consider it a plant to be cultivated or extirpated. Cattle, though fond enough of its foliage, do not eat the flowering stems which consequently remain and give the pasture a disagreeable appearance. It seems to be altogether unfit for hay, and therefore only to be sown where the field is intended for pasturage. Perhaps this is of service to cattle as medicine rather than as food. An ointment is made from it that is reckoned good against the scab in sheep. In some parts of Swe-

den they put it to beer in a fermenting state to produce inebriation.

2. *ACHILLEA SANTOLINA* (lavender cotton-leaved milfoil). *Leaves setaceous, toothed; segments subulate, reflexed.*—This sort has large yellow flowers which stand upon pretty long peduncles, singly, not in close bunches. Its leaves are like those of the lavender cotton, which, when rubbed, emit a strong oily odour. It flowers in June and July. It is a native of the Levant, but has been cultivated in England since 1759. May be increased by dividing its roots.

3. *ACHILLEA TOMENTOSA* (woolly yarrow). Eng. Bot. 2532. *Leaves bipinnate, hirsute; pinnae linear toothed.*—This is often planted in gardens for the sake of variety, and is very suitable and desirable for rock work. It is of humble growth, seldom rising more than eight or nine inches high. The leaves are finely cut and very hoary. The flowers are of a bright golden yellow colour and continue long in beauty. It grows naturally in the south of France, Spain, and Italy, and will live in the open air in England. It is increased by parting the roots, for which the best time of the year is October.

4. *ACHILLEA PURESCENS* (downy eastern sneezewort). *Leaves bipinnate; pubescent; leaflets lanceolate, serrated.*—This sort has no chaffs to the receptacle, and in that circumstance exceeds from the general character. It is a native of the Levant, and was cultivated in the Botanical Gardens at Chelsea in 1739.

5. *ACHILLEA ABROTANIFOLIA* (wormwood-leaved yarrow). *Leaves bipinnate, downy; pinnae very fine, linear entire, distant; corymbs, fastigiate compound.*—It grows to the height of two feet and a half, having large corymbs of yellow flowers on the top. Its leaves are somewhat like common wormwood, and cut into long narrow segments. Flowers in June and July. A native of the Levant. Cultivated in England, 1739.

6. *ACHILLEA CLAVENIA* (silvery-leaved wormwood). Bot. Mag. 1287. *Leaves downy, pinnatifid, smooth; segments, linear blunt; upper-toothed at end; corymb simple.*—This is a very humble plant, seldom rising above six inches high. The flowers are nearly as large as the *sneezewort*. They are

white, grow in flat corymbs and appear in June and July. The leaves have some likeness to those of *wormwood*, and are very hoary, growing close to the ground, and decaying in autumn. A native of the Alps of Switzerland. Introduced in 1683.

7. *ACHILLEA TANACETIFOLIA* (tansey-leaved sneezewort). Morris, t. 11. f. 14. *Leaves bipinnatifid; segments linear, lanceolate, flat, gashed, entire; corymb spreading compound.*—The stem of this sort is eighteen inches high and erect. The calyx is smooth and has brown edges. It is a native of the Grisons, and is not uncommon in the pastures and valleys of the Alps.

8. *ACHILLEA AGERATUM* (sweet Maudlin). *Leaves lanceolate, obtuse, sharply serrate; corymbs contracted.*—Commonly known by the title of *Sweet Maudlin*. It was formerly used in medicine more than it is at present. It is but little cultivated for sale. When inquired for in the markets, *Achillea Alpina* is commonly substituted for it; for though the true *Maudlin* is hardy in respect of cold; yet, in wet winters, the roots are often killed by moisture, especially when planted in good ground. When the plants grow out of the joints of walls or in rubbish, they will live many years without care. There are two varieties of this plant found growing naturally in Spain, one of them having longer and more compact umbels of flowers, and the other hath broader leaves and smaller flowers; but these approaching so near to the common sort in every other particular, I thought it would be needless to enumerate them as distinct species. The common *Maudlin* is propagated by parting of the roots, either in spring or autumn; and as it ripens seeds very well, so it may be propagated by sowing the seeds in April. It flowers in June and July, and the seeds are ripe in September.

9. *ACHILLEA ÆGYPTICA* (hoary Egyptian sneezewort). *Leaves pinnate; leaflets obtusely lanceolate, serrate-toothed.*—This sort rises from nine to twelve inches in height, with finely cut silvery leaves which remain all the year; and the plant growing close and low, it makes a pretty appearance at all seasons. The flowers, which are yellow, are produced in umbels on the top of the stalks. These appear in June, July, August, and Sep-

tember, and are of long duration, so that some of them frequently continue the greater part of the winter. This sort must have a dry soil and a warm situation, where it will endure the cold of our ordinary winter in the open air, but in a very severe frost they are often destroyed; a few plants therefore ought to be sheltered under a frame in winter, to preserve the kind. It is propagated by slips, which may be taken off and planted in a shady border, any time in summer, when they will take root in about six weeks, and then may be transplanted either into pots, or the borders where they are to remain. It rarely perfects its seeds in England.

10. *ACHILLEA PTARMICA* (common ptarmica or sneezewort). Curtis Lond. t. 60. *Leaves lanceolate, acuminate, finely serrate.*—This sort grows wild in the woods and other shady places in many parts of England, and therefore is not admitted into gardens. It creeps greatly by its roots so as to speedily cover a large spot of ground. It is sometimes used in medicine, and in the spring of the year the young tender shoots are put into salads to correct the coldness of other herbs. The roots are used for the tooth-ache, whence some have given it the name of *Field Pelitory*. There is a variety of this with double flowers, which is preserved in gardens, and is commonly known by the title of "*Double Maudlin*." When this is planted in pots (by which the roots are prevented from creeping), the stalks grow closer together, and they then make a tolerable appearance when in flower. It flowers in July and August. [The dried powder of the leaves, snuffed up the nostrils, provokes sneezing, whence its trivial and English name. The juice is pungent, provoking a flow of saliva. In Siberia, it is used with success in internal hæmorrhage, taken in form of a decoction of the whole plant.]

11. *ACHILLEA MACROPHYLLA* (few-leaved sneezewort). *Leaves pinnate, smooth; pinnae lanceolate, cut, serrated, outer larger and confluent.*—This sort produces many stalks, which rise to the height of nearly three feet, having loose branching corymbs of white flowers on their top, resembling those of the common sneezewort, but larger. The smell is similar, though the *feverfew* is somewhat pleasanter

than the common sneezewort. A native of the Alps; it is very hardy, thrives in almost any soil, but loves an open exposure, and deserves a place in our gardens. Introduced in 1759.

12. *ACHILLEA NANA* (dwarf milfoil). *Leaves pinnate-toothed, extremely hirsute, flowers glomerate-umbelled.* A native of the Alps, where it has been observed that the higher and colder its situation, the thicker the *tomentum* or flock that covers it. This species will thrive with us in almost any soil, but loves an open exposure. It hath hoary leaves, and the umbel of its flowers are more compact; the stalks do not rise to more than a foot in height.

13. *ACHILLEA NOBILIS* (noble or sweet milfoil). *Leaves bipinnate, the lower ones naked, flat, the upper obtuse, tomentose; the flowers in convex, and very crowded corymbs.*—A native of Italy, Germany, &c., but has been cultivated in England for more than a century. Its height is from eighteen inches to two feet. Its flowers and leaves are not so large as the common milfoil, but its scent is stronger and the qualities appear to be more powerful. The leaves are of a pale green, and not so long or so much cut as those of the first. It is equally hardy, and therefore requires little culture. Introduced in 1640.

14. *ACHILLEA ALPINA* (Alpine sneezewort or white maudlin). *Leaves lanceolate; tooth serrate; toothlets very finely serrate.*—This sort bears some resemblance to the *Achillea Ptarmica*, but its leaves are longer, deeper cut on their edges, and are of a darker green colour. It propagates itself sufficiently fast by its creeping root, and is very hardy. A native of Switzerland, Savoy, and Siberia. Introduced in 1731.

15. *ACHILLEA FALCATA* (silk-leaved milfoil). *Leaves linear, toothed, obtuse, flat; pinnae three-parted, crenate; corymbs simple.*—The stem, leaves, and calyxes, are downy white; leaves resembling those of *Achillea cristata*; the serratures deeper, but turned the same way; corymb as in *Achillea tomentosa*, but smaller, with sulphur-coloured flowers. It is a native of the East, where it is used in medicine.

16. *ACHILLEA IMPATIENS* (impatient milfoil). *Leaves pinnatifid, pectinate, smooth; pinnae linear, acute, lower two-parted; corymbs simple.*—The stem of

this species is slightly streaked, and reddish at the base. It is clothed with abundance of leaves from top to bottom, deeply cut into narrow, sharp, dark green pinnas, shining on both sides. The stem terminates in a handsome umbel of white flowers, which are large in proportion to most of this genus. It is frequent in all parts of Siberia.

17. *ACHILLEA SERRATA* (notch-leaved milfoil). *Leaves linear, lanceolate, sessile, tomentose, deeply serrate, lacinate at the base.*—The root of this sort is perennial. The flowers are large and resemble those of the *sneezewort*. There are ten florets in the ray, each having two notches at the end; the disk is elevated and gray. It flowers in September. Introduced in 1784.

18. *ACHILLEA MOSCHATA* (musk milfoil or Swiss Genipi). *Leaves pinnate, dotted; pinnae remote, subulate, almost entire; rays the length of the calyx.*—This is the true *genipi* of the Swiss, though in Savoy they call it *genipi bâlard*, and give the name of true *genipi* to the *Artemisia rupestris*. It bears so great a resemblance to the *Achillea atrata*, that it is not easily distinguished except by its pleasant aromatic smell. The root, however, is not sharp, the stems are lower, and the peduncles less tomentose. Either of them is an excellent sudorific, but hot and frequently injurious in the pleurisy, when the fever is high. It promises to be of much service in disorders arising from a debility of the solids, and is a grateful food to all sorts of cattle. It grows wild in Switzerland, on the high mountains of the Alps, in Savoy, Piedmont, and Austria. Introduced in 1775.

19. *ACHILLEA CRISTATA* (slender branched milfoil). *Leaves linear, serrate; serratures transverse, crested; stem branched, weak.*—Root perennial; stem roundish, somewhat tomentose. This species has been confounded with Linnæus's *Achillea falcata*, although that has yellow flowers and this has white ones. It is a native of the East, and flowers here in July and August.

20. *ACHILLEA CRETICA* (Cretan milfoil). *Leaves linear; pinnae roundish, imbricate backwards; stem tomentose.*—Flowers white. A native of Crete, and has the air of the common milfoil or yarrow.

21. *ACHILLEA HERBAROTA* (herbarota milfoil). *Leaves wedge-shaped, entire,*

toothed at the top.—The creeping roots of this species sometimes produce two or three packets of oblong, blunt, smooth leaves, enlarging towards the end, which is rounded and toothed at the base like those of *bellis* or common *daisy*. The whole plant is green, odorous, and but little tomentose. It is held in great esteem by the peasants of the Alps, and is recommended as a sudorific against worms, flatulencies, and intermittent fevers.

22. *ACHILLEA SQUARROSA* (rough-headed milfoil). *Leaves lanceolate, linear; pinnae ovate, wedge-shaped; stem somewhat villous.*—Introduced in 1775, by Mons. Thouin.

23. *ACHILLEA LIGUSTICA* (marjoram-scented milfoil). *Leaves pinnate; pinnae sharply toothed, flat, smooth.*—Stems rather woody, eighteen inches high, and leafy, branching, streaked, smooth, or a little hairy. Leaves rather thick and juicy. Flowers white. This species (as well as the last) has a very strong smell, like *maudlin*.

24. *ACHILLEA ODORATA* (scented milfoil). *Leaves bipinnate, oval, almost naked; corymbs fastigate, crowded.* Gerard and Haller consider this to be only a variety of *Achillea nobilis*. It is a native of Spain, Narbonne, Switzerland, &c.

25. *ACHILLEA MAGNA* (great milfoil or yarrow). *Leaves bipinnate, rather hairy; the divisions linear and toothed.*—This sort very much resembles the common milfoil, but is twice the size. The stem has hairs thinly scattered over it; indeed the whole plant is hairy. It is a native of Italy, but has been cultivated in Britain for a century and a half. Introduced in 1683.

26. *ACHILLEA EUPATORIUM* (Caspian milfoil). *Leaves bipinnatifid, hoary; segments lanceolate, serrated, linear.*—This species is a native of the Caspian shores, where it grows to about two feet in height, with yellow flowers. Introduced in 1803.

27. *ACHILLEA GERBERI* (Siberian milfoil). *Root-leaves pinnatifid, with entire segments; radical with three-fid segments; ray of the flower scarcely larger than the involucre.*—Described by Gmelin as a native of Siberia, about two feet in height, with pale yellow flowers. Introduced in 1821.

28. *ACHILLEA CHAMÆLIFOLIA* (dwarf milfoil). *Leaves pinnated; pinnae very*

narrow, distant, linear, long, entire.—This is about eight inches in height, with white flowers, which make their appearance in June. A native of France. Introduced in 1825.

29. *ACHILLEA ALBIDA* (whitish milfoil). *Stem pubescent; leaves pinnatifid, minutely cut, acute, bent upwards, rigid; nerve downy.*—A native of the Levant, where it produces its pale yellow flowers in July. Introduced in 1819.

30. *ACHILLEA CORONOPIFOLIA* (buck-thorn-leaved milfoil). *Leaves pinnatifid, pubescent; segments serrated, lanceolate.*—Also a native of the Levant, growing to nearly two feet in height, with pale yellow flowers. Introduced in 1823.

31. *ACHILLEA BISERRATA* (biserrate milfoil). *Leaves linear, lanceolate, unequally and finely biserrate, acuminate.*—A native of Albania. Height eighteen inches, with white flowers. Introduced in 1820.

32. *ACHILLEA ANTHEMOIDES* (chamomile-like milfoil). *Leaves pinnated, pubescent; pinnae blunt, linear, entire, lowest one longest.*—A very small species, with pale yellow flowers, from the Levant.

33. *ACHILLEA TENUIFOLIA* (slender-leaved milfoil). *Leaves pinnate; pinnae three-parted, entire, blunt, transversely imbricated.*—An annual, from the Levant, with yellow flowers.

34. *ACHILLEA PECTINATA* (comb-leaved milfoil). *Leaves pectinate, pinnatifid; segments entire, linear, subulate; corymbs contracted, compound.*—A very pretty species, with light yellow flowers, eighteen inches in height. A native of Hungary. Introduced in 1801.

35. *ACHILLEA SETACEA* (bristly milfoil). *Leaves bipinnate; pinnae linear, pilose, very compact, mucronate, setaceous; corymbs compound, fastigiata.*—It grows to about a foot in height, with white flowers, and may be increased by dividing the roots in a soil of peat and loam. A native of Hungary. Introduced in 1805.

36. *ACHILLEA MYRIOPHYLLA* (many-leaved milfoil). *Leaves bipinnate, downy; leaflets pinnatifid; segments linear, subulate.*—A perennial, two feet in height. A native of Germany. Introduced in 1798.

37. *ACHILLEA MICROPHYLLA* (small leaved milfoil). *Leaves bipinnatifid,*

shorter than the intervals between them; segments linear, entire.—A native of Spain, from whence it was introduced in 1800.

38. *ACHILLEA ASPLENIFOLIA* (rose-coloured milfoil). *Leaves pinnatifid, downy; segments toothed.*—A species from North America, a foot and half in height, with pink flowers. Introduced in 1803.

39. *ACHILLEA MICRANTHA* (small-flowered milfoil). *Leaves bipinnatifid, pubescent; segments entire, lanceolate.*—A native of the Levant, with yellow flowers. Introduced in 1808.

40. *ACHILLEA LINGULATA* (tongue-leaved milfoil). *Leaves oblong, linear, blunt, doubly serrated, downy, ciliated.*—An ornamental perennial, with white flowers. A native of Hungary. Introduced in 1815.

41. *ACHILLEA LANATA* (woolly milfoil). *Leaves bipinnatifid, villous; segments lanceolate, blunt.*—A small species from the south of Europe, with white flowers. Introduced in 1804.

42. *ACHILLEA DISTANS* (branching milfoil). *Leaves bipinnatifid; segments lanceolate, cut, serrated.*—It is three feet in height, with white flowers. A native of Italy, and will grow in a common garden soil.

43. *ACHILLEA CRITHMIFOLIA* (sampire-leaved milfoil). *Leaves downy, cauline, bipinnatifid; with linear, blunt segments.*—A very small ornamental species, with white flowers from Hungary. Introduced in 1804.

44. *ACHILLEA COMPACTA* (compact milfoil). *Leaves bipinnatifid, setaceous; segments entire, lanceolate.*—This species produces its pretty pale yellow flowers in July and August. A native of the Caspian shores. Introduced in 1803.

45. *ACHILLEA SPECIOSA* (spear-leaved milfoil). *Leaves lanceolate, finely and equally serrated, smooth; those of the base deepest.*—From the South of Europe, where it produces its white and yellow flowers in August; an ornamental species, two feet in height. Introduced in 1804.

46. *ACHILLEA DECOLORANS* (pale yellow milfoil). *Leaves acuminate, linear, equally toothed, very fine.*—Also from the south of Europe, with yellowish flowers. Introduced in 1798.

47. *ACHILLEA CRISTATA* (slender-branched milfoil). *Leaves linear,*

toothed; teeth ciliated.—A dwarf species, from Italy. Introduced in 1784.

48. *ACHILLEA ATRATA* (black cupped milfoil). *Leaves pinnate, smooth, pectinate; pinnae usually three-parted, linear, acuminate.*—The stems are many and hard, nine to twelve inches high. There is a great resemblance between this sort and the *Achillea moschata*, although (besides the distinctions mentioned in describing that species) they differ, inasmuch as the edges of the scales of the calyx of the *Achillea atrata* are black, as it were mortified, whilst those of the *moschata* are brown. A corymb terminates the branch with flowers decidedly larger than those of the *Achillea moschata*.—Most of the milfoils are hardy, herbaceous, fibrous-rooted perennials, with the flowers commonly in corymbs at the end of the stalk and branches; the ray in some yellow, in others white, in a few purple. The leaves in many of the species are pinnate, bipinnate, or superdecumbent; in a few they are simple. They are chiefly inhabitants of the Levant or the South of Europe. Only the *plurica* and the *millefolium* are natives of England.—All the species may be propagated by parting the roots either in spring or autumn. Many of them ripen their seeds here, which may be sowed in March or April and transplanting them at Michaelmas: they will then flower the following summer. They are for the most part hardy, and require little care in the cultivation.

ACHNODONTON (from *αχνη*, a chaff or husk, and *δοντις*, a tooth), in allusion to the toothed paleæ or inner valves of the flowers.

Class 3. 2. Triandria Digynia. Nat. Ord. *Gramineæ*.

Characters are—*Glume two valved, naked, with a point or little beard out of the nerve at its back; valves navicular, including the pallæ, which are two navicular and beardless; beard of the glume very minute.*

1. *ACHNODONTON BELLARDI* (bulous achnodonton). *Glumes keeled, smooth, membranous at edge.* This species is a native of Spain, flowering in the winter. Introduced in 1798.

2. *ACHNODONTON TENUE* (slender achnodonton). *Outer glume, a little prickly at the back.*—A native of Mesopotamæ. Introduced in 1804.

ACHRAS (the Greek name of the wild pear). The root is supposed to be found in *ac*, the Celtic for a point, in allusion to the many stout spines with which the tree is covered.

Class 5, 1. Pentandria Monogynia. Nat. Ord. *Sapotæ*.

Characters are—*The flower has a permanent empalement, composed of five oval leaves, which are acute-pointed and erect. It has five roundish heart-shaped petals, which are connected at their base, and end in acute points; and six short stamina the length of the tube, terminated by arrow-pointed summits, with an oval-germen, supporting a short style, crowned by an obtuse stigma; the germen afterwards becomes an oval succulent fruit, inclosing one or two oval hard nuts or stones.*

1. *ACHRAS MAMMOSA* (mammee sapota). *Leaves spear-shaped; fruit very large, oval; seeds oval, pointed at both ends.*—*Mammee Sapota*, otherwise called *Nippled* or *American Marmelade*, grows in America to the height of thirty-five or forty feet, having a straight trunk, covered with an ash-coloured bark. The branches are produced on every side, so as to form a regular head. The leaves are a foot in length, and nearly three inches broad in the middle. The flowers are cream-coloured, and are succeeded by large oval or top-shaped fruit, covered with a brownish skin, under which is a thick pulp of a russet colour, very luscious, called *natural marmelade*, from its likeness to *marmelade of quinces*. This tree is commonly planted in gardens for the fruit, which is by many persons greatly esteemed, in Jamaica, Barbadoes, Cuba, and most of the West India islands. There is a wild *mammee* which bears fruit of no value, but the tree is straight, tall, and tough, and is therefore useful for masts. There is a variety called the *Nisberry Bully Tree*, because it generally grows the tallest of all trees in the woods: its fruit is small; the seeds oblong and narrow; and is esteemed one of the best timber trees in Jamaica. The name of *Sapota* is what these fruits are called by the natives of America, to which some add the appellation of *mammee*; but there is no other name given to the fruits by the English, since they have settled in the West Indies. In this country it hath been hitherto grown only as a part of bo-

tanica collections, but some attempts have been lately made to cultivate it as a stove fruit, and we have no doubt they will be attended with success. Introduced in 1739.

2. *ACHRAS SAPOTA* (common sapota), Jac. Amer. t. 41. *Leaves oblong, oval; fruit smooth, turbinate.*—*Achras sapota* is a large, tall, straight tree, without knots or branches, for twenty feet or more. It rises to sixty or seventy feet, throwing out its branches on all sides. The head spreads into many small branches, which grow pretty thick and close together. The bark is dark gray, thick, and rough, full of large chops. The fruit is larger than a quince, round, and covered with a thick gray rind, which, when the fruit is ripe, becomes yellow and tough. The flesh is yellow as a carrot, and in the middle are two large rough flat stones, each much larger than an almond. The fruit smells very well, and the taste is agreeable. The shells that cover the seeds are generally of a shining or glossy brown cast, but the inward edge is always whitish or ruged. The kernel is bitter and may be used occasionally in strengthening emulsions. The bark of this sort, as also of the *Achras mammosa*, is very astringent, and goes by the name of *Cortex Jamaicensis*. It was once supposed to be the true Jesuit's bark, and as such given to the negroes, but with very ill effect. It has been tried in England, and found to be an excellent astringent, but very different from Jesuit's bark. Introduced in 1739.

3. *ACHRAS ZAPOTILLA* (Naseberry tree). *Brachiate, diffuse; fruit rounded, with the mucro of the hilum shorter.*—This species has a fruit as large as a bergamot-pear and similarly shaped. When it is green or first gathered, the juice is white and clammy, and will stick like glue; the fruit is hard; but when it has been gathered two or three days, it grows soft and juicy, and then the juice is clear as spring water and very sweet; in the midst of the fruits are two or three black stones or seeds, about the size of a pompon seed. It is esteemed an excellent fruit in the West Indies. In our stoves it is propagated like the *mamzee tree*.

4. *ACHRAS DISSECTA* (cloven-flowered sapota). *Flowers crowded; corollas cloven into eight parts; leaves obovate,*

bluntly notched at the end. This is a lofty tree, with a thick upright trunk and abundance of branches. The flowers are white and about half an inch in diameter. All the herbaceous parts of the tree are milky. It is cultivated in Malabar for the fruit, which is of the form and size of an olive, succulent; the pulp of a sweetish acid flavour, containing only one or two seeds, the rest of the cells being usually abortive. The leaves being bruised and boiled with the root of cucumbers and the leaves of ginger, are used for cataplasms to tumours. It is supposed to be a native of the Philippine Islands, whence it is called *manyikara* and *manilgate*, and by the Portuguese, *fruta manilba*. It probably grows also in China, for the Dutch call it *Chineesce pruynen*. Forster found it flowering in September in the island of Tongatabu.

5. *ACHRAS SALICIFOLIA* (willow-leaved sapota). *Flowers crowded; leaves lanceolate-ovate, acuminate.*—This tree is called in Jamaica *white bully tree* or *galimeta wood*. It grows to a considerable height with many branches towards the top, rising irregularly at distant stages, as in the firs. It is commonly straight and tapering, and most frequently found in the lower lands. The wood is pale yellow and reckoned good timber, but is mostly used in such parts of the building as are least exposed to the weather. No part of the tree is milky, its fruit is very large and pleasant. Browne enumerates three other sorts of *Achras*, viz. *beef wood*, *bastard bully tree*, and *mountain bastard bully tree*.—As these trees are natives of very warm countries they cannot be preserved in England, unless they are placed in the warmest stoves and managed with great care. They are propagated by planting the stones, but as these will not keep good long out of the ground, the surest method is to have the stones planted in tubs of earth, as soon as they are taken out of the fruit, and the tubs placed in a situation where they may have the morning sun, and kept duly watered. When the plants come up, they must be secured from vermin, and kept clear from weeds, but should remain in the country till they are about a foot high, when they may be shipped for England; but they should

be brought over in summer, and, if possible, time enough for the plants to make good roots after they arrive. During their passage they must have some water, while they continue in a warm climate; but as they come into colder weather, they should have very little moisture; salt water will soon destroy the plants if it get at them. When they arrive in England, they should be carefully taken out of the tubs, preserving some earth to their roots, and planted in pots filled with fresh earth, and then plunged into a moderate hot-bed of tanner's bark. If the weather be hot, shade the glasses with mats every day, in order to screen the plants from the sun, until they have taken new root; observing not to water them too much at first, especially if the earth in which they come over is moist; because too much water is very injurious to the plants before they are well rooted, but afterward they must be frequently refreshed with water in warm weather; and they must have a large share of air admitted to them, otherwise their leaves will be infested with insects and become foul; in which case they must be washed with a sponge to clean them, without which the plants will not thrive. In the winter they must be placed in the warmest stove, and as they grow they should be shifted into pots of a larger size, but must not be over potted, for that will infallibly destroy them. See Plate 4.

ACHYRANTHES (from *αχυν*, chaff, and *ανθος*, a flower, from the chaffy nature of the envelopes of flowers).

Class 5, 1. Pentandria Monogynia. Nat. Ord. *Amaranthaceæ*.

The characters are—*The empalement consists of five-pointed rigid leaves which are permanent; the flower has no petals; but in the centre of the empalement is situated the pointal, having a bifid stigma attended by five stamina, supporting small summits; the pointal afterwards becomes a single roundish seed inclosed in the empalement.*

1. **ACHYRANTHES ASPERA** (rough Achyranthes). *Leaves obovate, acute, narrowed at their base.* This sort hath been long in the English gardens, where it hath been preserved more for the sake of variety than for its beauty or use. It grows nearly three feet high, with oblong-pointed leaves; the

flowers come out in long spikes from the extremities of the branches, which are composed of an empalement, with a style and five stamina, but hath no petals, so may be ranged under the class of blank flowers. The plants of this sort must be raised on a hot-bed, and when they have acquired strength, they may be transplanted into the open ground, where they will flower in July, and their seeds ripen in September. If they are kept in pots, and put into a warm green-house in winter, they will live two or three years. It grows naturally in the islands of America, and also in India and Sicily.

2. **ACHYRANTHES INDICA** (Indian Achyranthes). *Stalk erect; leaves obverse, oval, waved; flowers reflexed.* The seeds of this sort I received from Malabar, which have for some years flourished at Chelsea, and annually produced ripe seeds, which have never varied from the parent plant.

3. **ACHYRANTHES LAPPACEA** (Barry Achyranthes). *Stem shrubby, diffused, prostrate; spikes interrupted, lateral; flowers having a bundle of hooked bristles on each side.* It is a lofty plant. A native of the Cape of Good Hope, but destitute of beauty sufficient to recommend it, except to those who cultivate flowers for the improvement of science.

4. **ACHYRANTHES LANATA** (woolly Achyranthes). *Spikes of flowers oval, produced from the wings of the leaves, which are covered with a soft down.*—Differs but little from the foregoing. It is a native of the same climate and requires to be placed in the stove during the winter, which it will then survive.

5. **ACHYRANTHES MURICATA** (prickly Achyranthes). *Leaves petioled, ovate, entire, ternate.* A native of India. Introduced in 1777.

6. **ACHYRANTHES CORYMBOSA** (corymbed Achyranthes). *Leaves four-fold, linear; panicles dichotomous, corymbed.*—An herb, a foot high, stem round, jointed. Stipules chaffy, and many leaflets from each axil in a fascicle, which perhaps are rudiments of future branches. The flowers resemble those of *Celosia*, and it was put into that genus formerly by Linnæus. A native of Ceylon.

7. **ACHYRANTHES DICHOTOMA** (dichotomous Achyranthes). *Leaves rough at the edge, twice as long as the joints*

of the stem.—The flowers resemble those of the *corymbosa*, although a native of Virginia, in the other hemisphere.

8. *ACHYRANTHES NIVEA* (white Achyranthes). *Leaves verticilled, ovate, tomentose; corymbs compact, dichotomous; flowers corolled.*—A native of the Canary Islands, whence it was brought here by Mr. Francis Masson, in the year 1780. It flowers from May to July.

9. *ACHYRANTHES PROSTRATA* (prostrate Achyranthes). *Stems prostrate, shrubby; spikes oblong; floscules in pairs, with a hooked fascicle on each side.*—The stems of this species are often creeping. It is a native of India.

10. *ACHYRANTHES ALTISSIMA* (tall Achyranthes). *Leaves ovate, acute, smooth, entire, petioled, alternate, half a foot in length.*—The stalk of this species climb up trees to the height of twenty feet. It is commonly found among low bushes about Spanish Town and Kingston, Jamaica, and in the woods of St. Domingo. Browne calls it *Bastard Hoop-withe*.

11. *ACHYRANTHES POLYGONOIDES* (many cornered Achyranthes). *Stem decumbent, four-cornered; leaves ovate, cordate.*—The stems are frequently eighteen inches high, branches alternate; leaves entire, smooth, wrinkled, alternate. It was found in Arabia by Forskahl, and in Malabar by Koenig. The Arabians call it *didjar* and *badjur*.

12. *ACHYRANTHES PORRIGENS* (crimson headed Achyranthes). Bot. Mag. t. 830. *Leaves opposite, lanceolate; spikes ovate, acute.*—This species is a very pretty shrub. It has been hitherto treated as a hardy stove plant, in which situation it continues to flower (though not expanded) through the whole of the winter, and seems peculiarly suited to enliven the bouquets of that season, when, of the few flowers that occur, there are scarcely any to be met with possessing so brilliant a colour which it preserves (as also its form) when dried. Its native country is unknown, but its resemblance to *Gomphrena Brasiliensis*, leads us to infer that it came originally from South America. It may be propagated by cuttings. They may all be propagated in the same manner as *Achyranthes aspera* and will perfect their seeds the first year, but the plants of the *Achyranthes Indica, lappacea, and lanata* may be preserved through the winter, if placed in a stove, but they are

too tender to be kept in a green-house where there is not artificial heat. They all root pretty freely by cuttings, are of easy culture, but little beauty. *Achyranthes porrigens* is the only handsome species.

ACIA (from the vernacular name *Aciona* in Guiana).

Class 16. 6. Monadelphia Dodecandria. Nat. Ord. *Pomaceæ. Rosaceæ.* Juss.

Characters are—*Calyx a one-leaved perianth, five-parted. Corolla five-petalled, unequal. Drupe full of chinks.*

1. *ACIA GUIANENSIS* (Guiana *Acia*). *Leaves alternate, smooth, entire, firm, waved about the edge.*—Is a tree, with a trunk sixty feet in height, and three or four feet in diameter, covered with a gray bark. The fruit is of the size of a walnut covered with a thick, woody, fibrous coriaceous skin of a brown colour, cracking irregularly and adhering to the stone which is thin and easily breaks. It encloses a large kernel of an irregular form, dividing into two parts. The Creoles at Cayenne eat it when brought to market in August; they reckon it good fruit and extract an oil as sweet as that of almonds from it. They call the tree *coupi*; the wood is hard and heavy, of a white colour inclining to yellow.

ACICARPHA (from *axis*, a point, and *καρπος*, a palsea) from that being spiny.

Class 19. 4. Syngenesia. Necessaria. Nat. Ord. *Calyceæ.*

Characters are—*Involucrum, five-parted. Corollas all tubular. Receptacles paleaceous, the palea being united with the pericarps after flowering. Stamens half separate. Pappus none.*

1. *ACICARPHA SPATULA* (spatulate *Acicarpha*). *Leaves spatulate.*—This is a curious little plant, a native of Brazil, and may be increased by dividing its roots and planting them in a mixture of peat and loam. It requires to be kept in the bark-stove, and is perennial. Introduced in 1824.

ACIDOTON (from *ακιδωτος*, pointed from the pointed hairs of the leaves).

Class 21. 7. Monœcia. Polyandria. Nat. Ord. *Terebintaceæ.*

1. *ACIDOTON URENS* (stinging *Acidoton*). Slo. Jam. l tab. 83. fig. 1. *Leaves alternate, ovate, lanceolate; flowers in racemes.*—Sloane observes, "that this shrub, even when young, rises to eight or nine feet in height, with a round, straight, woody trunk, covered with a

smooth, brownish bark. The leaves were of a dark green colour, and had several ribs on its under side, and on its surface and on the edges many long, small prickles," which, as he was told were very burning and looked so fierce, "that he was very loath to make the experiment, but very cautiously took the top of the shrub and dried it." A native of Jamaica, growing in the woods on the hills. Introduced in 1793.

ACISANTHERA (from *axis*, a point, from the pointed anthers).

Class 10. 1. Decandria. Monogynia. Nat. Ord. *Salicariæ*.

Characters are—*Calyx* ventricose, five-cleft. *Petals* five. *Anthers* sagittate. *Capsule* two-celled, crowned, many seeded.

ACISANTHERA QUADRATE (four-sided *Acisanthera*). Br. Jam. tab. 22. fig. 1. *Leaves* three-nerved, opposite, crenate, ovate.—This species seldom rises above fourteen or sixteen inches in height, the stem is firm and square; leaves are small, and remarkable, and the flowers are produced singly from the alternate *alæ* of the leaves. It requires but little water in winter, and is easily increased by cuttings, in sand, plunged in a moist heat. Introduced in 1804.

ACMELLA (from *axos*, a point; from the pricking taste of the leaves).

Class 19. 2. Syngenesia superflua. Nat. Ord. *Compositæ*.

Characters are—*Involucre* simple, with a few leafy divisions. *Receptacle* oblong. *Heads* radiant.

1. ACMELLA MAURITIANA (balm-leaved *Acmella*). Rump. Am. t. 65. *Stem* pubescent, procumbent; *leaves* entire, ovate; *ray* shorter than the disk.—A small and uninteresting bark-stove annual from the Mauritius, with yellow flowers. Introduced in 1768.

2. ACMELLA BUPHTHALMOIDES (oval-leaved *Acmella*). *Ray* many flowered; *leaves* serrate, three-nerved, ovate.—This species also bears yellow flowers, requires the protection of a green-house; increased by seeds sown in common earth. Introduced in 1798.

ACNIDA (from *a priv.* and *Knîd*, a nettle; to which it bears some resemblance, without having its pruriency).

Class 22. 5. Diœcia pentandria). Nat. Ord. *Scabridæ*. *Altriplices*. Juss.

ACNIDA CANNABINA (Virginia hemp).—This plant grows spontaneously in

Virginia and some other parts of North America, but is not cultivated in Europe, except in some botanic gardens, for the sake of variety. It hath male and female flowers growing on different roots, and so is near akin to hemp, under which title it has been formerly arranged by some botanists; it is a plant of little beauty, and no use has as yet been made of it.

ACONITUM (wolfsbane, or monkshood), of *ἀκόν*, or *ἀκν* a dart, because the Barbarians used to daub their darts therewith; others of *ἰκνέω*, to accelerate, because it hastens death; or, from *ἀκόνις*, this plant growing on rocks destitute of soils).

Class 13. 3. Polyandria. Trigynia. Nat. Ord. *Multisiliquæ*. *Ranunculacæ* Juss.

Characters are,—*The flower* hath no empalement, but consists of five unequal petals, which vary in different species; the galea (or hood) is tubulous, and covers the other parts of the flower like a friar's cowl; the two lateral petals, which inclose the stamina and style are equal; these are concave and slightly indented in the middle. The two lower petals are narrow and oblong; in the bottom of the flower are placed two nectarii, upon which are situated the styles; in some there are two, in others three, and some have five; these are forked, and stretch out far beyond the stamina, which are numerous and irregular: after the flower is past, the germen become oblong, seed-vessels terminated in a point, and coalescing at their base; these have but one cell, which is filled with angular rough seeds.

1. ACONITUM LYCOCTONUM (yellow wolfsbane, or monkshood). *Leaves* palmate, multifid, villous; *helmet* conical, cylindrical.—This sort grows three feet high and upwards; flowers about the middle of June, and, if the season is not warm, will continue in flower till August. It seems to be milder than some of the other species cultivated in 1596, by Gerard.

2. ACONITUM ALTISSIMUM (greatest yellow wolfsbane). *Leaves* palmate, nervous, smooth.—This sort usually attains to the height of four feet; the flowers also are larger than those of the *Lycotconum* and appear at the same time. In Sweden it is reckoned among the earliest of the spring flowers. A decoction, or the powder of the root is

used for destroying flies and other insects. It was cultivated here in 1596.

3. *ACONITUM VARIEGATUM* (variegated, or small blue monkshood). *Flowers with five pirtils; divisions of the leaves parted half way, broader above; spur thick, somewhat spiral; helmet conical.*—This sort flowers later in the season, and seldom grows more than two feet high, the spikes are rather short. The flower often changes from variegated to plain. It is a native of the Alps, Bohemia, &c. There are several varieties in our gardens of this species, in some the flowers are pale blue, or blue and white, and in others white.

4. *ACONITUM ANTHORA* (salutary monkshood). *Spur thick and spiral; divisions of the leaves linear, acute.*—It is this sort that was formerly made use of in medicine, and was esteemed an antidote to the poisonous species; (whence by some writers it is called *Anthora* and *Antithora*, the poisonous ones having been named *Thora*), but happily that dangerous error is now exploded. Those with blue flowers are supposed to be of a much stronger quality than the yellow or white flowered kinds. It is confidently affirmed that the huntsmen on the Alps, who hunt the wolves and other wild animals, dip their arrows into the juice of these plants which renders the wounds made by them deadly. This plant, though absurdly called *salutary monkshood*, is only poisonous in a less degree than the other species. (Haller, however, declares it to be the most dangerous.) The taste of the root is sweet with a mixture of bitterness and acrimony. The smell is pleasant. It purges vehemently when fresh, but loses its qualities when dried. It is not used in modern practice. It does not flower till the middle of August, nor are the flowers so large as some of the other sorts, they are of a sulphur colour. They look pretty in the border of a flower-garden, but will not thrive in the shade as some of the other sorts will. Many varieties of this species are mentioned by botanical writers, several of which are common in our gardens.

5. *ACONITUM ALBUM* (white wolfsbane). *Helmet conical, with a long claw; leaves 3-5 parted, with trifid toothed lobes.*—This species has a tall stem, about six feet in height, with palmate leaves and white flowers. It is

rare in Europe and was brought from the Levant.

6. *ACONITUM PANICULATUM* (panicked monkshood). Bot. Cab. 810. *Helmet conical, half circular; spur short, thick, spiral.*—Like the rest of this numerous genus, it is perennial, hardy, and very showy. It grows about two feet high, and flowers in August. It will flourish in any good loam or garden mould, either in a pot or in the full ground, and may be increased by separating the tubers of the root. A native of Switzerland.

7. *ACONITUM ALPINUM* (large flowered monkshood, or wolfsbane). *Leaves pinnatifid; flowers large.*—This sort will grow to the height of five feet in good ground; the flowers are very large but not many upon a stalk. They are of a deep blue colour. It flowers in August and makes a very pretty appearance.

8. *ACONITUM PYRENAICUM* (yellow Pyrenean monkshood, or wolfsbane). *Helmet conical, cylindrical, compressed; leaves many parted, divisions linear, incumbent and squarrose.*—This sort grows to the height of about four feet, with a long spike of yellow flowers of a middling size. If allowed a place in the garden it should be among shrubs in such situations as are not frequented by children. It grows wild on the Pyrenees, in Tartary, and Siberia.

9. *ACONITUM COMMARUM* (purple monkshood). *Divisions of the leaves wedge-shaped, gashed, acute.* It is found wild in Switzerland, Savoy, Austria, &c. and generally has a stem six feet high.

10. *ACONITUM NAPELLUS* (common monkshood or wolfsbane). *Leaves divided down to the petiole, with linear, acute, furrowed lobes; ovaries three smooth.*—This species, the name of which *napellus* is derived from *napus*, a turnip; (its grumous roots resembling that root) has frequently been mistaken for the *Aconitum neomontanum*, so strongly recommended by Baron Störk, and is one of our most active vegetable poisons. It is still retained in the *London* and *Edinburgh Pharmacopæias*. The flowers, which are of a deep violet colour, proceed alternately on the spikes, and are supported on short axillary pedicels. The stem is erect, firm, covered with leaves, eighteen inches high.

Linnaeus says, "it is fatal to kine and goats, especially when they come fresh

to it and are unacquainted with the plant; but that it does no injury to horses who eat it, only when dry." He also relates (in the *Stockholm Acts*) that an ignorant surgeon prescribed the leaves, and, on the patient refusing to take them, he took them himself and died. The ancients, who were unacquainted with chemical poisons, regarded the *aconite* as the most violent of them all; and fabled it to be the invention of Hecate, and to have sprung from the foam of Cerberus. Some persons, by merely taking the effluvia of the herb (when in full flower) by the nostrils, have been seized with swooning fits and have lost their sight for two or three days. But the root is unquestionably the most powerful part of the plant. Matthioli relates that a criminal was put to death by taking only one drachm of it. Dodonæus gives us an instance (recent in his time) of five persons at Antwerp who ate the root by mistake, and all died. Dr. Turner also mentions that some Frenchmen at the same place, eating the shoots of this plant for those of *masterwort* all died in the course of two days, except two players who quickly vomited all they had taken. We have an account in the *Philosophical Transactions* of a man who was poisoned in the year 1732, by eating some of this plant in a salad instead of celery. Dr. Willis, also in his work, *De Anima Brutorum* gives an instance of a man who died in a few hours by eating the tender leaves in a salad. He was seized with all the symptoms of mania. The *aconite*, thus invested with terrors has however been so far subdued as to become a powerful remedy in some of the most troublesome disorders incident to the human frame. Baron Stöerck led the way by administering it in a violent pain of the side and joints, in glandulous scirrhi, humours, ulcerous tubercles of the breast, &c., in quantities from ten to thirty grains in a dose, of an extract, the method of making which he describes.

A curious experiment was made by Mr. Brodie, by which it was in a manner proved, that the juice of *aconite*, injected into the intestines, occasioned death by destroying the functions of the brain. An ounce of the juice of the leaves was injected into the rectum of a cat. Three minutes afterwards he voided what appeared to be nearly the

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whole of the injection. He then stood for some minutes perfectly motionless, with his legs drawn together. At the end of nine minutes from the time of the injection, he retched and vomited, then attempted to walk, but faltered and fell at every step as if from giddiness. At the end of thirteen minutes he lay on his side insensible and motionless, except some slight convulsive motions of the limbs; the respiration now became slow and laboured, and at forty-seven minutes from the time of the injection he was apparently dead; but the heart was found regularly contracting one minute and a half afterwards, at the rate of one hundred times in a minute, from which it would seem that the brain is not *directly* necessary to the action of the heart, and that when that action ceases it is rather in consequence of the cessation of respiration, which is indeed under the influence of the brain.—The *common monkshood* will grow under the shade of trees, in woods, or wildernesses, and will increase very fast by means of its creeping roots; for though most of the other species delight in the shade, yet this is the only one that will thrive under trees, for which reason it should be planted in shady borders, which are overhung by trees, when it will continue much longer in flower, and thrive better than in an open exposure. There are two or three varieties of this sort, one with white, another with rose-coloured, and a third with variegated flowers, and were it not for their noxious quality they would deserve a place in every garden. It grows spontaneously in the Alpine forests of Sweden, Switzerland, and other parts of Europe.

10. ACONITUM JAPONICUM (Japanese monkshood). *Leaves trifid, palmate; divisions gashed, blunt; stem round and smooth, the spike of the flowers short.*—It is a native of Japan, and there called *soo huso*. It differs from the first in having the leaves only deeply trifid, the divisions toothed, and the teeth rounded.

11. ACONITUM UNCINATUM (American monkshood, or wolfsbane). Bot. Mag. t. 1119. *Flowers mostly with five styles; leaves many lobed; helmet extended very far.*—The leaves of this species are less deeply divided than in any other, a character that distinguishes it at first sight. It is a hardy perennial,

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sweet flag, from which the present species is distinguished by the shortness of that portion of its stalk, which is above the spadix, as well as by all its parts, except the florets, being five times smaller than in that plant. It is probably a native of China; at least it is frequently cultivated, for the sake of its smell, in pots, about the habitations of the Chinese, from whence Mr. Aiton obtained it in 1786. The Chinese *sweet grass* must be kept in a dry stove, and does not require a great degree of heat.]

ACTÆA (from ἀκτῖς, *planta littoralis*, shore-loving; from ἄκτις *elder*, which this plant resembles in foliage and fruit).

Class 13, 1. Polyandria Monogynia. Nat. Ord. of *Multisiliquæ*.—*Ranunculaceæ*. Juss.

The characters are—*The empalement of the flower is composed of four concave obtuse leaves, which fall off; the flower hath four petals which are much larger than the empalement. In the centre is placed the oval germen, crowned with an oblique depressed stigma, attended by numerous slender stamina, crowned with erect double roundish summits. After the flower is past, the germen becomes an oval or globular berry, having one cell, in which are lodged four seeds, which are roundish on their outsides, but angular where they are joined.*

1. ACTÆA SPICATA (common herb Christopher or baneberry). Eng. Bot. 918. *Leaves 2-3 terrate; raceme ovate; berries roundish.*—This sort grows naturally in several places in the northern counties of England. I found it in great plenty in a wood near Kirby Lonsdale, as also near Ingleborough Hill, in Yorkshire. It grows two feet and a half high, the foot-stalks of the leaves arise from the root; these divide into three smaller foot-stalks, each of which divide again into three, and these have each three lobes, so that each leaf is composed of twenty-seven lobes (or small leaves). The flower-stem which arises from the root is garnished with leaves of the same form, but are smaller. On the top of the stalk appear the flowers, which grow in ramose spikes, and are of a pure white; these come out in May, and are succeeded by black shining berries about the size of *peas*, which ripen in the autumn. The berries, and indeed the whole herb, which is fetid and nauseous, are universally

allowed to be poisonous. The juice of the berry, mixed with alum, yields a black dye.

2. ACTÆA ALBA (American white baneberry). *Leaves bi-triternate; berries ovate, oblong.*—It grows naturally in North America, from whence I have received the seeds: the leaves of which are somewhat like those of the *spicata*, but are not so deeply indented on their edges. The flowers grow in a more compact spike, and the berries are very white and transparent when ripe; the roots of this is composed of thick tubers, or knobs. It is an abiding plant, and delights in a light moist soil and a shady situation.

3. ACTÆA RACEMOSA (American black or wild snakeroot). *Racemes very long, berries dry.*—This sort is a native of North America, where it is called *black snakeroot*, to distinguish it from the common *snakeroot*. This plant hath large compound leaves, which rise immediately from the root, and are branched after the same manner as the first sort, which grow more than two feet high. The flower-stems frequently rise to the height of four or five feet, being terminated by a long spike of white flowers, which is reflexed at the top. This flowers in June, or beginning of July, but does not perfect seeds in England. During the time of its flowering, the plant makes a good appearance in a garden, and therefore deserves a place in the shady borders, or among shrubs; where, if it be not over-hung by them, it thrives very well, and being hardy, will require no other care than the shrubs themselves. The root of this plant is greatly used by apothecaries and physicians in America, in many disorders, and is supposed to be an antidote against poison, or the biting of the rattle-snake.

These plants propagate by seeds, and should be sown soon after they are ripe; for if they are kept out of the ground till spring, the plants will not come up till the year after, so that a whole year will be lost. They should be sown on a shady border, and kept clean from weeds. As the seeds seldom come up all at the same time, the border in which they are sown should not be disturbed till the following autumn, to see what plants may appear; when the plants should be transplanted into a shady border, where they may

species prodigiously but with very little reason, most of them being mere varieties.]

All the sorts of *monkshood* may be propagated by seeds, which should be sown in the autumn, in a shady situation; they will then appear the spring following; whereas, if they are sown in the spring, they generally lie till the year after, before they come up. The ground must be kept clean from weeds all the summer, and the plants should be watered in dry weather, till they are fit to transplant; when they are to be carefully taken up, and planted in shady borders, at the distance of fourteen inches each way, observing to water them till they have taken good root; after which they will require no other care, but to keep them clean from weeds, till the following autumn, when they may be transplanted to the places where they are to remain. They then require no more attention than to cut down the stalks in autumn, after they have done flowering. See Plate 9.

ACORUS (the sweet rush), *Αcoros*, *Αcoron*, derived from *αcoron*, the *pupil*, because it was esteemed good for disorders of the eye.

The characters are—*It hath a simple cylindrical stalk, which is closely covered with small flowers, so as to form a sort of catkin, or iulus. These flowers have no empalement, but are composed of six concave obtuse petals. In the centre of the flower is situated a swelling germen, attended by six stamina, which are extended beyond the petals, and are crowned with thick double summits; the germen afterwards turns to a short triangular capsule, having three cells, in which are lodged many oval oblong seeds.*

Class 6, 1. Hexandria Monogynia. Nat. Ord. *Piperitæ*—*Aroideæ*. Juss.

1. ACORUS CALAMUS (common sweet rush). *The point of the scape very long, leafy.*—This plant grows naturally in standing waters which are shallow, and is found wild in some parts of England; particularly in Norfolk, and also near Uxbridge, in Middlesex, and in several parts of the north. In Holland this plant abounds in most of their ditches and standing waters. The leaves of this plant, when broken, send forth a strong aromatic scent; the roots are much stronger, and have been long used in medicine.

[Linnæus asserts this to be the only native aromatic plant of northern climates; the root powdered might supply the place of foreign spices. The flavour is much improved by drying. The roots are commonly imported from the Levant, but those of our own growth are quite as good. The Turks candy them, and consider them as a preservative from contagion. In many counties of England (where the plant abounds), it was formerly used to strew the floors of houses instead of rushes, a purpose for which its fragrant leaves made it very suitable. The aromatic principle is an essential oil which can be obtained by distillation. The root has been employed in medicine ever since the time of Hippocrates. By the moderns it is successfully used in intermittent fever, even after bark has failed, and is certainly a very useful addition in *cinchona*. It is also a useful adjunct in bitters, and stomachic infusions. Thomson says, it is too seldom prescribed, and although the plant is abundant in the fenny districts of England, yet what is used by druggists is imported from the Levant. No cattle whatever eat of it. The whole plant has been used for tanning leather; and it is supposed that the French snuff, *a la violette*, receives its scent from this root. Throughout the United States it is used by the country people as an ingredient in making bitters. In Poland, the floors of the better sort of people are strewed with it when going to receive company, and the leaves bruised by the feet of the guests, fill the rooms with a grateful odour, not altogether useless, as well as agreeable in such a country.]

It may be transplanted into a garden, where if the ground is moist, it will grow very well, but never produces its spike, unless it grows in the water. It loves an open situation, and will not thrive well under the shade of trees. The spikes of flowers (which are by many writers termed *Juli*), appear toward the latter end of June, and continue till August. When this plant is fixed in a proper situation, it will multiply by its creeping roots very fast.

[2. ACORUS GRAMINEUS (grass-leaved sweet flag or Chinese sweet grass). *Point of the stalk scarcely extending beyond the top of the spadix.*—The whole herb has an aromatic smell when bruised, much resembling our *E*

large swelling near the root.—*Monkies' bread, or baobab*, is considered the largest or rather broadest tree in the world. The account, which Monsieur Adanson gives of those he saw at Senegal and other parts of Africa, in regard to the size of them, is amazing, several of which he says, "measured round their stems from sixty-five to seventy feet in circumference, but their height was not extraordinary. The trunks of these trees were from eight to twelve feet high, dividing into many horizontal branches which touched the ground at their extremities; these were from forty-five to fifty-five feet long, and were so monstrous, that each branch was equal to a large tree in Europe; and where the water of a neighbouring river had washed away the earth, so as to leave the roots of one of them open to the view, they measured one hundred and ten feet long, without including those parts of the roots which remained covered with earth or sand:" for he describes the plains, where the trees grow, "to be a barren moveable sand, so that from its being continually shifted by the winds, there are no tracts discoverable, whereby persons can be guided in travelling over them." The circumference of a full-grown tree, measuring the circle which surrounds the branches, is said in some cases to be as much as four hundred and fifty feet. Indeed, its bulk is so enormous, that at a distance, it bears a greater resemblance to an overgrown forest than to a single tree. It is beneath the grateful shade of its spreading boughs that the wearied negroes lie down, when scorched by the burning sun of their sultry climate; and it is the friendly shelter of its overhanging branches that the benighted traveller seeks, when overtaken or threatened with a storm. The countries of Africa, which are particularly favourable to the production of this tree, and in which it chiefly flourishes, are those which lie along the coast and shores of the Niger, as far down as the Kingdom of Benin.

The blossoms are as gigantic in proportion as the tree which bears them: they begin usually to appear about the month of July. The fruit ripens towards the latter end of the month of October, or in the early part of November. It differs greatly in its shape;

sometimes it is oblong, at others globular. It is very prettily marked, and is suspended by a pedicle or stalk, the length of which is nearly two feet.

The age of this tree is not the least extraordinary part of its history. From names and dates which appear to have been carved upon some of them by Europeans, we are led to conclude that they were in existence five or six centuries ago. Humboldt speaks of this tree as "the oldest organic monument of our planet."

Adanson makes the following calculation of its age, diameter of the trunk, and height.—A tree

Years old.	Inches in diameter.	Feet in height.
1	1 ½	5
20	1 ft.	15
30	2	22
100	4	29
1000	14	58
2400	18	64
5150	30	73

The negroes of Senegal dry the bark and the leaves in the shade, and then reduce them to a fine powder. This powder, which is of a green colour, they preserve in little linen or cotton bags, and term it *lillo*. They use it at their meals and in their cookery, putting a pinch or two into their food, in the same manner as we do pepper and salt, not so much with an idea of giving a relish to the dish, as with a view to preserve their health, to keep up a perpetual and plentiful perspiration, and to temper the too great heat of their blood; purposes for which, if we may credit the reports of several Europeans, it is admirably calculated. There is an epidemic fever, which generally rages in parts of Africa during the months of September and October, when the rains having on a sudden ceased, the sun exhales the water left by them upon the ground, and fills the air with noxious vapours. During this critical season, a light decoction, prepared from the leaves of the *baobab* tree (gathered the preceding year, and carefully dried in the shade), is reckoned a most serviceable remedy.

Nor is the fruit less valuable than the leaves or bark. The pulp, in which the seeds are enveloped, forms a very grateful, cooling, and slightly acid food, and is often eaten as a treat by the natives: the richer sort amongst them

mix sugar with it to correct its acidity. At Banjole, it forms the principal part of the food of the natives, who season many of their dishes with it, especially a kind of gruel, made of corn, and called rööy. The woody bark of the fruit, and the fruit itself, when spoiled, help to supply the negroes with an excellent soap, which they procure by drawing a ley from its ashes, and by boiling it with rancid palm-oil. The *Mandinjos* convey the fruit to the eastern and more southern districts of Africa, and through the medium of the Arabs it reaches Morocco and even Egypt, where they reduce the pulp to a powder, and use it in dysentery, and all sorts of fluxes.

The negroes on the eastern coast of Africa, employ the trunks in a certain state to a very extraordinary purpose. The tree is subject to a particular disease, owing to the attack of a species of fungus, which vegetates in the woody part, and which, without changing its colour or appearance, destroys life, and renders the part so attacked as soft as the pith of trees in general. Such trunks serve, when hollowed out, as tombs and burial places for the poets, musicians, and buffoons of the tribe. Characters of this description are in great esteem amongst the negroes whilst living; they erroneously ascribe to them talents superior to the rest of their fellow-creatures; which peculiar gifts they are supposed to derive from a commerce with demons, sorcerers, and bad spirits. This causes them, during their life-time, to be much respected and courted by their various and respective tribes; but their bodies, after death, are far from being treated with this respect; on the contrary, they are regarded with so great a horror, that they deny them the rites of burial—neither suffering them to be put beneath the ground, nor to be thrown into the sea or rivers, from a superstitious dread that the water thus dishonoured would refuse to nourish the fish, and that the earth would fail to produce its fruits. In order, therefore, to get rid of the bodies, without degrading either the sea or land, they enclose them in the hollow trunks of the trees, where, in the course of ages, they become quite dry and sapless, without actually rotting, and form in that manner a description

of mummy without the help of embalmment.

In Abyssinia, the wild bees penetrate the trunks of the *taobab* for the sake of lodging their honey within them. This honey is said to possess a very peculiar and delicious fragrance and a very agreeable flavour, on which account it is more esteemed and sought after than any other.]

Prosper Alpinus, in his *History of Egyptian Plants*, describes this tree; but he does not mention any of them as near the size of those described by M. Adanson.

There were some plants of this sort in several gardens in England, which were raised from seeds obtained from Grand Cairo, in the year 1724, by the late Dr. William Sherard, some of which were grown to the height of eighteen feet; but in the severe winter, 1740, they were all lost, and since that time there had not been any of the seeds brought to England, till M. Adanson having returned to Paris in 1754, sent some of the seeds over here, which have succeeded, and many of the plants are now upwards of eight feet high. Though introduced to Britain so long ago, it has never flowered, and is not likely to do so in our sovs. without more room than can in general be afforded.

It is propagated by seeds, which must be procured from the country where it grows naturally (for it doth not produce any in Europe), these must be sown in pots, and plunged into a hot-bed, where, in about six weeks, the plants will come up, and in a short time after be fit to transplant; when they should be each planted in a separate pot, filled with light sandy earth, and plunged into a fresh hot-bed, observing to shade them until they have taken new root; they should have free air admitted to them every day in warm weather, but must be sparingly watered, for as their stems are soft (especially when young) too much wet will cause them to rot. As the plants advance in their growth, they are to be shifted into larger pots, but must constantly be plunged into the bark-bed, being too tender to thrive in this country without artificial heat. The plants when young, make great progress in their growth, where they are properly

treated; for in three years many of them have been more than six feet high, and have put out several lateral branches, their stems were also proportionable; but after four or five years' growth, they are almost at a stand, their annual shoots rarely exceeding two or three inches. See Plates 8 and 9.

ADELIA (from α privative, and δλος visible; the parts of fructification are so minute as to be hardly visible).

The characters are—*It hath male and female flowers upon different roots; the male flowers have an empalement of one leaf, cut into five concave segments, but no corolla; it hath many slender stamina, the length of the empalement crowned by roundish summits. The female flowers have a five-leaved concave empalement which is permanent; they have no corolla, but a roundish germen with three short divaricated styles, and torn stigma. The capsule hath three cell's, each containing one roughish seed.*

Class 22, 13. Diœcia Monadelphica. Nat. Ord. Euphorbiaceæ.

1. ADELIA BERNARDIA (villous-leaved adelia). *Leaves oblong, downy, serrate.*—It grows naturally in the Island of Jamaica, and is near akin to the *Croton*. It is about six feet in height. Introduced in 1768.

2. ADELIA RICINELLA (smooth-leaved adelia). *Leaves obovate entire.*—This species grows to the height of eight or ten feet, and has slender flower stalks. A native of Jamaica.

3. ADELIA ACIDOTON (box-leaved adelia). *Branches flexuose; spines gemmaceous.*—It seldom rises above four feet in height, and has much the appearance of a young *ebony*. It flowers in June with us; and in Jamaica, of which it is a native, early in April and May.

These plants were constituted a genus by the title of *Bernardia*, in honour of the celebrated Bernard de Jussieu, but Linnæus altered it to *Adelia*. They are propagated by seed, which must be sown in a hot-bed in spring; and when fit to remove, they should be transplanted each into a separate small pot, filled with light earth, and plunged into a hot-bed of tan, treating them in the same manner as will be hereafter directed for *Croton*. In the autumn the pots should be

plunged into the tan-bed in the stove, where, if they are kept in a temperate heat in winter, and not over watered during that season, the plants may be preserved, and the summer following they will produce flowers; but as these have little beauty, the plants are seldom propagated except in botanic gardens.

[ADENANDRA (from ἀνδρ-, a gland, and ἀντρανδρος, a male; or, in composition of botanical names, a stamen, on account of the appendage of the stamens).

Class 5, 1. Pentandria Monogynia. Nat. Ord. Diosmeæ.

Characters are—*Calyx five-parted; petals and stamens inserted in the calyx; stamens ten, of which every other one is sterile; anthers with a gland at end.*—This is a very natural genus easily recognised by its glandular anthers.

1. ADENANDRA UNIFLORA (one-flowered adenandra). Bot. Mag. t. 273. *Leaves lanceolate, smooth; flowers terminal, solitary; calyxes fringed.*—This plant forms a small bushy shrub; the leaves are thickly and irregularly set on the branches, quite up to the flowers, which stand singly on their summits; they are without scent. The germen is studded with a constellation of little glands, which pour forth and almost deluge it with nectar. A native of the Cape. Introduced in 1775.

2. ADENANDRA UMBELLATA (umbel-flowered adenandra). Bot. Mag. t. 1271. *Leaves oblong, smooth, ciliated; flowers terminal in umbels; calyxes smooth.*—This is a very ornamental species, with a stem a foot and a half high; the flowers growing in terminal umbels from one to eight; the leaves when bruised, have a strong aromatic scent. Although very nearly allied to *Adenandra uniflora*, we do not hesitate to consider this species as distinct. Introduced in 1789.

3. ADENANDRA FRAGRANS (red-flowered adenandra). Bot. Mag. t. 1519. *Leaves ovate, oblong, glandular, scattered; peduncles glutinous, aggregate, terminal, twice as long as leaves.*—A shrub two or three feet high, with erect twiggy branches; the flowers terminal, but having a young shoot frequently extending beyond them, very showy, and of a beautiful rose colour. The whole plant is very aromatic, and is otherwise one of the most desirable of the whole genus. Introduced in 1812.

4. *ADENANDRA ALBA* (white-flowered adenandra). *Leaves linear, mucronate at the edge, rough, cartilaginous; flowers solitary, axillary.*—An ornamental shrub two feet in height, with white flowers, which it produces freely from March to July. Introduced in 1800.

5. *ADENANDRA MARGINATA* (marginated adenandra). *Leaves cordate, lower ovate, upper lanceolate; umbels terminal.*—It grows from two to three feet in height, with pink flowers. Introduced in 1806. Sweet says he found this genus "to succeed best in sandy peat, but some prefer mixing a little sandy loam with it. The young tender tops strike best, made into cuttings, and planted in a pot of sand under a bell glass; it does not require to be plunged in heat."]

ADENANTHERA (bastard flower-fence) from *aden* a gland, and *anthera* an anther, each anther tipped with a gland.

Class 10, 1. Decandria Monogynia. Nat. Ord. *Leguminosæ*.

The characters are—*The empalement of the flower is of one leaf, slightly cut into five at top; the flower is of the bell-shaped kind, and is composed of five petals, which are reflexed and concave on their under side. In the centre is situated an oblong germen, supporting a style crowned with a simple stigma; this is attended by ten erect stamina of the same length, which are crowned with roundish summits. After the flower is past, the germen becomes a long compressed pod, containing many convex smooth seeds, placed at a distance from each other.*

1. *ADENANTHERA PAVONIA* (yellow-flowered adenanthera). *Leaves decomposed, smooth on each side.*—This is one of the largest trees in the East Indies, and the timber is in common use on account of its solidity. The duration is two hundred years. The natives use the powder of the leaf in their ceremonies. The seeds, besides being eaten by the common people, are of great use to the jewellers and goldsmiths, on account of their equality for weights, each of them weighing four grains. In this country it is so tender as to require a stove to preserve it through the winter. The young plants (which are not more than two feet high), have large branching leaves, composed of many equal divisions, gar-

nished with small oval leaves, which are placed alternately on the midrib, and are of a bright green colour. The stems of the plant are woody, the bark of a brown colour, and the leaves continue all the year. I have not yet seen any flowers produced in England; but by some dried samples brought from India, they appear to be small and of little beauty. The fine branching leaves of the plant, however, make a very handsome appearance in the stove. The seeds are of a shining black colour, and are somewhat larger than those of the *great lentil*, and nearly of the same shape. This plant must be raised on a hot-bed, and afterwards placed in the bark stove with other tender exotics.

There is a variety of this kind, with scarlet seeds, which is at present rare in this country. The seeds were received from India, from which many plants have been raised; but they are of very slow growth in England.

2. *ADENANTHERA FALCATA* (woolly-leaved adenanthera). Ru. Amb. t. 11. *Leaves decomposed; tomentose underneath.*—This species is little known, not having been long cultivated in England. It is described by Rumphius as an ornamental shrub, five feet in height. Introduced in 1830.

2. *ADENANTHERA SCANDENS* (climbing adenanthera). *Leaves pinnate, two-paired; leaflets ovate, oblique, smooth; claspers terminal, bifid.* It has never been cultivated in England, and is therefore little known.

These plants must be raised on a hot-bed, and afterwards placed in the bark-stove with other tender exotics.

ADIANTUM, i. e. (maidenhair).

Class 24. Cryptogamia. Ord. *Filices*.

The characters are—*This genus is distinguished from the other capillary plants by the fructification, being confusedly joined in oval spots, and the points of the leaves reflexed.*—There are many species of this genus, which are natives of the East and West Indies, differing greatly in size from each other. I have upwards of fifty-nine species in my collection of dried plants, which, to enumerate in this place, would be superfluous, as they have not been introduced into the English garden.

1. *ADIANTUM CAPILLUS VENERIS*.

(true maidenhair). *Fronde decom-pound; pinnules stalked and acniform, lobed.*—This species is a native of the south of Europe and the Levant, and is sometimes found (though not frequently) in Wales and Scotland, growing wild on the rocks. This is the sort intended when directed to be used in medicine. It usually grows out of the joints of walls and the fissures of rocks, and those who wish to cultivate it in their gardens should plant it in pots filled with gravel and lime-rubbish, in which it will thrive much better than in good earth; but the pots must be sheltered under a frame in winter, otherwise the plants are often killed by the frost.

2. *ADIANTUM PEDATUM* (Canadian maidenhair). *Fronde pedate; leaflets pinnate; pinnae gibbous before, gashed, fruit-bearing.*—It is often preserved in gardens for the sake of variety. It may be preserved in pots and treated in the same manner as the former; for although it will live through the winter in the open air in moderate seasons; yet, in severe frost, it is sometimes destroyed. This grows naturally in Canada in such quantities, that when the French were in possession of that country, they sent it from thence as a package for other goods.

3. *ADIANTUM TRAPEZIFORME* (rhomb-leaved or black American maidenhair). *Fronde supra-decompound; pinnule cut, crenate towards the upper edge.*—This sort grows naturally in very warm countries. I received it from Jamaica in a tub of earth among other plants. It will not thrive in England, unless preserved in a stove, where its shining black stalks and odd-shaped leaves will afford an agreeable variety among other exotics.

4. *ADIANTUM RENIFORME* (kidney-leaved maidenhair). *Fronde kidney-shaped, alternate, many-flowered.*—It is a native of Madeira, requiring the protection of a green-house. Introduced in 1699.

5. *ADIANTUM RADIATUM* (radiated maidenhair). *Fronde digitate; leaflets pinnate; pinnae one-flowered.*—This elegant little plant rises by a simple stalk to the height of six or nine inches. It is a native of St. Domingo and Jamaica. Introduced in 1776.

6. *ADIANTUM VILLOSUM* (hairy-stalked maidenhair). *Fronde bipinnate;*

pinnae rhombed, fructifying before and without; stipe villous.—It is two feet in height and requires a stove in England. A native of Jamaica. Introduced 1775.

7. *ADIANTUM TENERUM* (tender maidenhair). *Pinnules alternate; rhomb-wedge-shaped, blunted, gashed; fructifications interrupted.*—It has a black-shining branched stipe, from fourteen to eighteen inches high, and is found in shady places in Jamaica, of which it is a native. Introduced in 1793.

8. *ADIANTUM MACROPHYLLUM* (large-leaved maidenhair). *Fronde pinnate; pinnae opposite; rhomboid acute; the lower larger, the lowest sub-hastate; reflex fructifications continue in front and below.*—It is a native of Jamaica, and delights in moist and shady places. Introduced in 1793.

9. *ADIANTUM PULVERULENTUM* (dusty maidenhair). *Fronde bipinnate; pinnae oval, truncate.*—An elegant looking plant. A native of South America. Introduced in 1793.

ADINA (from *adinos*, clustered, its flowers being in heads).

Class 4, 1. Tetrandria Monogynia. Nat. Ord. *Rubiaceae*.

Characters are—*Corolla infundibular; filaments inserted into the mouth of the corolla; stigma turbinate; seeds 2-3 in each cell.*

ADINA GLOBIFLORA (globe flowered Adina). A small Chinese plant, with white flowers. It may be increased by cuttings. Introduced in 1804.

ADLUMIA (a name unexplained by its author, Mr. R. Schmaiz).

Class 17, 2. Diadelphia Hexandria. Nat. Ord. *Fumariaceae*.

Characters are—*Petals four, united in a fungous monopelateous corolla, persistent, with two protuberances at base.*

ADLUMIA CIRRHOSA (spongy-flowered adlumia). A tail climbing biennial plant, of little beauty in its white-purple flowers, but covering a large space in the course of a summer. It rises to nearly eighteen feet in height. A native of North America. Introduced in 1778.

May be increased by dividing its roots, and planting them in a mixture of sandy loam.]

ADONIS (so named from Adonis, the favorite of Venus, the plant being fabled to have sprung from his blood, when wounded by a boar).

Class 13, 4. Polyandria Polygynia. Nat. Ord. *Ranunculaceae*.

The characters are—*The empalement of the flower is composed of five concave, obtuse, coloured leaves which fall off. The flower in some species of five petals, and in others of ten or fourteen. In the centre there are many germina collected in a head, which are attended by a great number of short stamina, crowned by oblong inflexed summits; after the flower is past, the germina become so many naked seeds, closely adhering to the pedicle, and forming an obtuse spike.*

1. *ADONIS ÆSTIVALIS* (tall Adonis, or summer pheasant's eye). *Corollas five-petalled, oblong, obtuse; heads of seeds ovate.* This species is a native of the southern countries of Europe, and is found in corn-fields. It flowers in May and June, the flowers are of a deep crimson colour. I have cultivated this sort above thirty years, and have never observed it to vary either in the shape of its leaves, colour, make of the flower, or growth of the plants, which are much taller than the second, the leaves thinner, sparingly set on the stalks, and of a lighter colour. It is an annual plant, and if sown in autumn, it will appear in the following spring. It thrives best in a light soil and the seed should be sown where it is intended they should remain, as it will not bear transplanting.

2. *ADONIS AUTUMNALIS* (pheasant's eye, common Adonis, red Maithes, or red morocco). Our common *Adonis* has the stalk about a foot high, the flowers of a scarlet colour, with the bottom internally black, externally greenish. It grows in Kent, particularly by the side of the river Medway, between Rochester and Maidstone, where it is found in great plenty in the fields, which are sown with wheat; but, in the intermediate years, when the fields are sown with spring corn, there is rarely a plant of it to be found, which shows the propriety of sowing the seeds in autumn, for those fields of spring corn, if suffered to remain undisturbed after the harvest, will abound with this plant the following year. For some years past, great quantities of the flowers of this plant have been brought to London, and sold in the streets by the name of *red morocco*. It flowers in the beginning of June, and the seeds ripen in August and September.

3. *ADONIS VERNALIS* (perennial, or

spring Adonis). *Flowers twelve-petalled; heads of seed ovate.*—This species has a perennial root, with an annual stalk. It grows naturally on the mountains of Bohemia, Prussia, and other parts of Germany, where the root is often used as the true black hellebore, though the description of this plant given by the ancients will by no means agree with it. It flowers towards the latter end of March, or the beginning of April, (according to the season) the stalks rise about a foot and a half high, and are garnished with fine slender leaves, which are placed in clusters at intervals. At the top of each stalk is produced one large yellow flower, composed of an unequal number of petals, the centre of which is occupied by a large number of germen, surrounded by many stamens. After the flowers drop, the germen becomes naked seeds, closely adhering to the foot stalk, forming an obtuse spike. These ripen in August, and should be sown soon after, otherwise they seldom succeed. When the plants come up, they must be carefully kept clean from weeds, and, in very dry weather, if they are now and then refreshed with water, it will promote their growth. They should remain in the place where they are sown until the second year, for they make but slow progress while young. The best time to transplant them is in autumn, when they ought to be planted where they are to remain, for if often removed, they will not produce many flowers, nor those flowers be so strong as on the plants which are unremoved.

4. *ADONIS FLAMMEA* (flame-coloured Adonis). *Flower large; petals flat, acute; fruit in a cylindrical head.*—A native of Austria, growing in corn-fields. Introduced in 1800.

5. *ADONIS FLAVA* (yellow pheasant's eye). *Petals flat, oblong, twice as long as the calyx.*—Very abundant in the corn-fields and vineyards of the south of France.

6. *ADONIS PYRENNICA* (Pyrenean Adonis). *Petals 8-10 oblong, entire, cuneate.*—The stem of this species is more than a foot in height, with many branches. The flowers are yellow and almost sessile. A native of the Pyrenees. Introduced in 1817.

These plants may be increased by parting the roots, either in autumn or spring; being hardy and easily culti-

vated, and producing their showy flowers early in the season; they are desirable plants for the garden.

ADOKA (from *a priv*, and *doxa gloria*. An ignoble plant, one of no show). Moschatellina. *Tournef.* 68. (from a slight odour of musk which it possesses).

Class 8. 4. Octandria Tetragynia. Nat. Ord. *Succulentæ*—*Saxifragæ*. Juss.

The characters are—*The empalement of the flower is bifid and permanent, upon which rests the germen; the flower is of one leaf, which is cut into four acute segments. The germen is situated in the centre, supporting four erect styles, these are attended by eight stamina, crowned by roundish summits; after the flower is past, the germen becomes a round berry, resting on the empalement, which hath four cells, each containing a single compressed seed.*

ADOKA MOSCHATELLINA (bulbous, fumitory, hollowroot, or tuberosus moschatel).—This plant grows naturally in shady woods in divers parts of England; I have frequently gathered it on the top of Hampstead among the bushes, near the wood; it is a very low plant, seldom rising more than four or five inches high, the leaves resemble those of the *bulbous fumitory*. The flower-stalk arises immediately from the root, upon the top of which is placed four or five small flowers of an herbaceous white colour; these appear the beginning of April, and the berries ripen in May, soon after which the leaves decay. There is little beauty in this plant, the leaves and flowers smell like *musk*, from whence it has been by some called *musk crowfoot*. The roots may be transplanted any time after the leaves are decayed, till winter. They must be planted in the shade, under shrubs; for, if they are exposed to the open sun, they will not thrive.

[ÆGILOPS (from *αἴγος* *ai-gos*, goat's face, from its roughness).

Class 23. 1. Polygamia Monœcia. Nat. Ord. *Gramina*, or *Grasses*.

Characters are—*Corolla, a glume terminating in a threefold awn; styles two; seeds one.*

1. ÆGILOPS OVATA (oval spiked wild fescue). *All the calyxes with three awns.*

2. ÆGILOPS CAUDATA (Cretan wild fescue). *All the calyxes with two awns.*

3. ÆGILOPS TRIUCIALIS (long-spiked

wild fescue). *Lower calyxes with two awns, the rest with three.*

4. ÆGILOPS SQUARROSA (rough spiked wild fescue). *Spike awl shaped, longer than the awn.*

These plants are a sort of grass, growing naturally in many parts of Europe, are rarely cultivated. The *Ægilops ovata* is a common Sicilian grass; when ripe, it is gathered by the peasantry, who tie the heads up in bunches, and set them on fire; they burn with rapidity, and so give the grains a slight roasting, which are then considered agreeable food.

The ancients believed that these plants had the power of curing a disease of one corner of the eye, which seems to have been what we call *fistula lachrymalis*. They all seem to be annual.

ÆGIPHILA (from *αἴξ* and *φίλος*, goats being fond of it).

Class 4. 1. Tertandria Monogynia. Nat. Ord. *Verbenaceæ*. Juss.

Characters are—*Calyx four-toothed; corolla quadrid; style semibifid; berry seeded.*

1. ÆGIPHILA MARTINENSIS (Martinique ægiphila). *Leaves ovate, lanceolate, smooth.*—This is a shrub six feet high, with white flowers, and is found on the edges of woods in the Island of Martinico. It flowers in November.

2. ÆGIPHILA FORTIDA (fœtidægiphila). *Leaves hirsute.*—It is a climber, and rises frequently to six or seven feet or more. A native of Jamaica.

It is an easily cultivated genus, cuttings root freely under a hand-glass, in heat, the soil should be a light loam.

AGOPODIUM (from *αἴξ* *ai-gos*, a goat, and *πῦς*, a foot, from the parts of leaves resembling the cloven foot of a goat).

Class 5. 2. Pentandria Digynia. Nat. Ord. *Umbelliferæ*.

Characters are—*Fruit oblong, ovate, streaked.*

ÆGOPODIUM PODAGRARIA (gout weed or ashweed, Herb. Gerard.) This plant grows naturally in several places near London, but the roots run so fast in a garden, as to render it a troublesome weed. It is eaten in Sweden, boiled for greens, when tender in the spring.

Although it is aromatic like most umbellate plants, it is not admitted into medicinal use, nor has it any title to its name of *goutweed*, though formerly much prized for the purpose of assuaging its pains.

Culpepper says, "It is not to be supposed that *gout-wort* hath its name for nothing, but upon experiment to heal the gout and sciatica, as also joint-aches, and other cold griefs. *The very bearing of it about one easeth the pains of the gout, and defends him that bears it from disease!!!*" Meyrick and Hill are, however, more reasonable; the former calls the roots and leaves "a good external application for the sciatica and other pains, whether they are employed as a fomentation or poultice; and though many extol their efficacy in the gout, he says they are well omitted in that complaint, as they are seldom productive of any lasting good effects, and may sometimes be the occasion of much distress and mischief." The latter (Hill) recommends the root, and fresh buds of the leaves, as excellent fomentations for pains, and says he has seen a good effect from a quantity of the leaves and roots boiled soft together, and applied to the hip in the sciatica, keeping a fresh quantity hot to renew the other as it grew cold, but he advises not to make any use of it for the gout.

ÆRANTHES (from *aer*, the air).

Class 20, 1. Gynandria Monandria.
Nat. Ord. *Orchidææ*.

Characters are—*Lip spurred; membranous entire; jointed.*

1. ÆRANTHES GRANDIFLORA (large-flowered ærantes). *Spur emarginate.*—This very singular plant is a native of Madagascar, and has been successfully cultivated in the gardens of the Horticultural Society, in a decomposed woody soil. Introduced in 1823.

2. ÆRANTHES SESQUIPEDALIS (long-horned ærantes). *Spur very long, filiform.*—This species bears very large white flowers (which appear singly or two or three together), with a spur a foot and a half in length. It makes a most splendid appearance. A native of Madagascar. Introduced in 1823.]

ÆSCHYNOMENE (from *αἰσχύνωμαι*, *pu-difio*: on account of its retreating from the touch).

Class 17, 4. Diadelphia Decandria.
Nat. Ord. *Papilionaceæ* or *Leguminosæ*.

The characters are—*The empalement of the flower consists of one leaf, cut into two equal segments, the upper being bifid, and the lower trifid; the flower is of the butterfly kind, the standard being large and heart-shaped; the two wings*

are oval, and shorter than the standard; the keel is moon-shaped, and as long as the standard; in the bottom of the flower is situated an oblong hairy germen, supporting an arched style, attended by ten stamina, nine of which coalesce, and the other is separated from them; after the flower is past, the germen becomes a long, plain, jointed pod, which separates at the joints, in each of which is lodged one kidney-shaped seed.

1. ÆSCHYNOMENE SENSITIVA (shrubby æschynomene). *Stem shrubby, smooth; leaflets obtuse; legumes smooth and even, obtuse; stipules acute, deciduous.* A native of the West Indies, growing to about three feet in height with yellow flowers, which it produces in July and the seeds ripen in October. Introduced in 1733.

2. ÆSCHYNOMENE INDICA (Indian æschynomene). *Stem herbaceous, smooth; legumes smooth, swelling on one side, obtuse; leaflets obtuse.*—An ornamental shrub two feet high. A native of the East Indies. Introduced in 1799.

3. ÆSCHYNOMENE ASPERA (rough-stalked æschynomene). *Stem herbaceous, rugged; joints of the legumes rugged in the middle.*—*Æschynomene aspera* rises to the height of four or five feet, with a single herbaceous stem, which is in some parts rough. The leaves come out on every side towards the top, forming a sort of head; they are composed of a great number of smooth glaucous pinnæ. The flowers come out from between the leaves, two or three together upon long petioles: they are yellow. The legume is about four inches long. A native of the East Indies.

4. ÆSCHYNOMENE AMERICANA (hairy æschynomene). *Stem herbaceous; bis-bid; joints of the legumes semi-cordate; leaflets acuminate, bractes ciliate.*—This species is somewhat sensitive; during the night, and at the approach of rain, the leaves fold together. A native of Jamaica, on the south side of the island, in dry pastures. It was cultivated in 1739.

5. ÆSCHYNOMENE ARBOREA (arborescent æschynomene). *Stem arborescent, smooth, joints of the legumes semi-cordate, smooth.*—*Æschynomene arborea* grows to the height of six or seven feet, with a single stem; the leaves are smooth, and come out towards the top

of the stalk, forming there a sort of head; they are composed of many pinne, placed alternately on the midrib. The flowers come out from the wings of the leaves, two or three together: they are large and of a copper colour.

6. *ÆSCHYNOMENE PUMILA* (dwarf æschynomene). *Stem herbaceous, smooth; legumes serrate on one side, rough in the middle; leaflets acuminate.*—*Æschynomene pumila* is an annual, about half a foot in height, branching at bottom. The leaves are pinnate and lanceolate; the leaflets crowded and linear. A native of the East Indies.

All the plants of this genus are propagated by seeds, which should be sown on a hot-bed early in the spring; and when the plants have strength enough to be removed, they should be put each into a separate small pot filled with light earth, and plunged into a fresh hot-bed, from whence, as they advance in growth, they should be shifted into larger pots, but great care should be taken not to over-pot them, for if the pots be too large, the plants will not thrive.

ÆSCULUS (from *esca* food. It had the old names Hippocastanum and Castanea equina, from the similitude of the fruit to that of the chesnut, and from its being given to horses).

Class 7, 1. Heptandria Monogynia.

Characters are—*The empalement of the flower consists of one leaf, slightly cut into five segments; the flower is composed of five roundish petals, folded at their border, and waved; these are narrow at their base, and are inserted in the empalement; in the centre is placed a roundish germen, having a single style, crowned with a pointed stigma, attended by seven stamina, which extend to the length of the petals, and are declining, crowned with upright summits; when the flower is past, the empalement becomes a thick, roundish, echinated capsule, opening into three cells, in one or two of which are lodged globular seeds.*

1. *ÆSCULUS HIPPOCASTANUM* (common horse-chesnut). The *horse-chesnut* was brought from the northern parts of Asia into Europe about the year 1550, and was sent to Vienna about the year 1558. From Vienna it migrated into Italy and France: but it came to us from the Levant immedi-

ately. Gerard, in his *Herbal*, speaks of it only as a foreign tree. In Johnson's edition of the same work, it is said, "*Horse-chesnut* groweth in Italy, and in sundry places of the East countries; it is now growing with Mr. Tradescant at South-Lambeth." Parkinson says, "Our Christian world had first the knowledge of it from Constantinople."

The same author places the *horse-chesnut* in his orchard as a fruit-tree, between the walnut and the mulberries. How little it was then (1629) known, may be inferred from his saying not only that it is of a greater and more pleasant aspect, for the fair leaves, but also of as good use for the fruit, which is of a sweet taste, roasted and eaten as the ordinary sort.

This tree was in much greater esteem for avenues and walks formerly, than at present. It is come into disrepute, because the leaves decay early in the summer, so that it occasions a litter in gardens and plantations, from July till they are all fallen; but notwithstanding this inconvenience the tree has great merit, for it affords a noble shade very early; and during the time of its flowering, no tree has more beauty, for the extremities of the branches are terminated by fine spikes of flowers, so that every part of the tree seems covered with them, and being intermixed with the large digitate leaves, they make a noble appearance.

Few trees make a greater progress than this. I have known some raised from nuts, which in twelve or fourteen years, were large enough to shade two or three chairs under the spread of their branches, and were covered with flowers. There are many old trees now standing, which having been planted singly, are grown to a large size, their heads forming a fine natural parabola. I have measured some of them, whose branches have extended more than thirty feet, and their heads have been so close, as to afford a perfect shade in the hottest seasons. These were planted in 1679; so that although they are of quick growth, yet they are not of short duration.

As the wood is of little value, this tree should not, however, be propagated in too great plenty; but a few of them only placed at proper distances in parks, for ornament, and for the deer, who keep much about them in windy wea-

ther, watching the falling of the nuts, and greedily devouring them as they fall. In Turkey, the nuts are ground, and mixed with the provender for their horses, especially those which are troubled with coughs, or are broken winded.

In the old way of planting these trees in avenues, great part of their beauty was lost; for when their branches meet, fewer flowers are produced, and most of these are hid from sight; their leaves will also decay much sooner in close plantations than in single trees: the great beauty of them is to stand singly upon lawns, or in parks, where their fruit will be of use to the deer, who are very fond of them. In such situations, especially when they can be placed so as to terminate a view, there is not a finer object than they afford during their season of flowering, which is in May; and when the weather is moderate, they will continue in beauty near a month.

The common horse-chesnut is propagated by sowing the nuts; the best time for doing this is early in the spring; but the nuts should be preserved in sand during the winter, otherwise they are apt to grow mouldy and rot. They may indeed be put into the ground in autumn, but then they will be in danger of rotting, if the winter should prove very wet, as also of being disturbed and eaten by vermin. [Others however, affirm that if they are kept till spring, many will miscarry]. When the nuts succeed, and have a proper soil, the plants will shoot near a foot the first summer; so that where they grow pretty close together, it will be proper to transplant them in the following autumn, planting them in rows at three feet distance, and one foot asunder in the rows; in this nursery they may remain two years, by which time they will be fit to plant where they are designed to be continued; for the younger these trees are planted out, the larger they will grow. But there are many who will object to their being planted out young in parks, because they will require a fence to secure them against cattle, which will also be necessary whatever size they are when planted; and if large, they must be well staked to prevent their being displaced by strong winds; and when we consider how much faster a young tree will grow than one which is removed

at a greater age, there can be no excuse for planting large trees. The horse-chesnut requires little care in the management (is never injured by cold in our climate), and will thrive in most soils and situations; but in a sandy loam it makes the greatest progress; and if the soil be inclining to moisture, the leaves will continue in verdure much longer than in very dry ground. There is something very singular in the growth of this tree, which is that the whole shoot is completed in less than three weeks after the buds are opened, in which time I have measured shoots a foot and a half long, with their leaves fully expanded; and no sooner are the flowers fallen, than the buds for the succeeding year are formed, which continue swelling till autumn, at which time the folding covers are spread over with a thick tenacious juice, serving to defend the tender buds from the frost and rain in winter; but upon the first return of warmth in the spring, this melts and runs off, leaving the bud at liberty to extend. This juice is never so far hardened as to injure the tender buds, which are always formed at the extremity of the former year's shoot; a plain direction not to shorten them, for by so doing the shoots are entirely cut off. There are varieties of this tree in the nurseries, both with gold and silver striped leaves. These are increased by layers, and by budding or ingrafting them upon stocks of the common sort.

2. *ÆSCULUS FLAVA* (yellow-flowered horse-chesnut). *Leaves digitate, with five leaflets; the laminas of the corolla cordate, roundish.*—This species flowers in May and June, and is a native of North Carolina.

3. *ÆSCULUS PAVIA* (scarlet horse-chesnut). *Flowers with eight stamina; leaves digitate, with five or six serrate leaflets; capsules smooth; laminas of the corolla obovate; claws the length of the calyx.*—This species rises to the height of twenty feet, but does not spread its branches to any extent. The flowers appear in June, and are sometimes succeeded by fruit, but the seeds rarely ripen in England. It grows naturally in Brazil, Carolina, Japan, and several parts of the East. The scarlet horse-chesnut may also be propagated by the nuts, which must be procured from the countries where the trees naturally grow. They should be sown in

pots early in the spring; and the pots must be plunged into a moderate hot-bed to forward their growth; towards the end of May, the pots should be plunged into the ground in a south-east border, and in dry weather the plants should be duly watered, that they may acquire strength by the autumn, when it will be very proper to screen the plants from early frosts, which often pinch the top buds, and occasion their decay in the winter; for while the plants are young, they are impatient of frosts, but when they have obtained strength, they should be carefully separated, and planted at the distance of a foot from each other, in a sheltered situation; and the following winter, when it proves cold, it will be proper to cover the plants with some light covering. After the second winter, they will require no further sheltering.

ÆTHUSA (from *αἶσω* to burn, on account of its dangerous acidity).

Class 5, 2. Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The characters are—*Seeds ovate, convex, with five tumid, rounded, acutely-keeled ribs; flowers all perfect, slightly radiant.*

1. *ÆTHUSA CYNAPIUM* (fool's parsley). Eng. Bot. 1192. *Leaves all of one shape; leaflets wedge-shaped, decurrent; with lanceolate segments.—Fool's parsley*, so called from the deleterious properties of the plant, and the resemblance it bears to *parsley* (for which it is sometimes unfortunately used), is an annual plant, common in gardens and cultivated grounds in every part of Britain and Ireland, flowering from June to September. From a root which is slender and spindle shaped, the stem rises to the height of two feet; it is erect, striated, and generally of a dark purple colour at the base. This plant being so abundant a weed in rich garden soils, is frequently mistaken for common parsley, and therefore deserves to have its character and noxious qualities universally known and exposed. Although it bears a strong resemblance to the garden-parsley, it exhibits differences in its botanical characters, by which it may at once be distinguished. The leaves of fool's parsley are finer, more acute, decurrent, and of a darker green; and, instead of the peculiar parsley smell, have, when bruised, a disagreeable odour. When the flower-

stem of the fool's parsley appears, the plant is readily distinguished from all other umbellate plants, by what is called its *beard*, three long, pendulous leaves of the involucre under the partial umbels. The flowers too of the fool's parsley are *white*, those of the garden parsley pale *yellow*. In order to prevent mistakes, it is best to cultivate the *curled* variety of the common parsley only, as it not only possesses the same virtue, but also makes a more elegant garnish. Buckhave states, that "a boy, six years of age, having eaten this plant at four in the afternoon, which he took for parsley, began immediately to utter cries of anguish, and complain of cramps in the stomach; while he was going to his father's house, the whole of his body became excessively swelled, and assumed a livid appearance; his breathing became every moment more difficult and short, and he died towards midnight. His tongue was black; a brownish serosity was found in the stomach, and the liver was hard, and of a yellow colour; the spleen livid; but the body was not at all emphysematous." When eaten in small quantities it occasions vomiting, which may be stopped by a very large dose of brandy. Most cattle eat it: yet it is said to be very deleterious to geese.

2. *ÆTHUSA FATUA* (fine-leaved fool's parsley). *Leaflets very fine whorled; stem very leafy; common involucre many-leaved.* This species flowers in August and September; not known of what country it is a native.

3. *ÆTHUSA MEUM*.—This is a perennial plant, rising a foot and a half high. It grows wild in the mountains of Switzerland, Germany, Austria, Corsica, Italy, and Spain, also in the high pastures of Westmoreland, Cumberland, Lancashire, and Merionethshire. It blossoms in May; the roots and seeds are aromatic and acrid; they are recommended as carminatives and stomachics: in the stone, stoppage of urine, and all uterine disorders, sometimes they are given to cure tertians. *Spicknel* is an ingredient in the rica and mithridate, and appears to be of the same nature as *lovage*. It is a powerful diuretic and remover of obstructions in the viscera, consequently good against the gravel, jaundice, &c. The root is the part to be made use of for

these purposes, and an infusion of it is the best preparative dried and given in powder—it strengthens the stomach, creates an appetite, and is good against the colic.

This is a hardy plant, and may be increased by parting the roots at Michaelmas, or by sowing the seeds soon after they are ripe, which takes place in July and August. They should have a shady situation and a moist soil.

4. *ÆTHUSA BUNIOUS* (coriander-leaved fool's parsley). *Radical leaves pinnate, cauline, manifold, setaceous.*—This is a perennial plant. A native of the Pyrenees. It flowers in July.

AFZELIA (named by the late Sir E. Smith after Dr. Adam Afzelius, an amiable and excellent Swedish botanist).

Class 1, 10. Decandria Monogynia. Nat. Ord. *Leguminosæ*.

The characters are—*Calyx tubular, with a four-cleft deciduous limb; petals four, with claws, the upper very large; upper filaments sterile; pods many celled; seed with an arillus at base.*

AFZELIA AFRICANA (African Afzelia). *Leaves alternate, abruptly pinnated; pod woody; seeds black, with a scarlet arillus.*—This species, the only one of the genus at present known, is a timber tree, rising to the height of thirty feet or upwards. It is a native of Sierra Leone, and was introduced in 1821. It may be increased by cuttings, which should be planted in a rich mould.]

AGAPANTHUS (from *αγαπη* to love, and *ανθος* a flower; lovely flower).

Class 6, 1. Hexandria Monogynia. Nat. Ord. *Hemerocallidæ*.

The characters are—*Flower funnel-shaped, regular, six-parted; stamens declinate.*

1. *AGAPANTHUS UMBELLATUS* (large-flowered African blue lily). Bot. Mag. t. 500. *Peduncles length of corolla; leaves linear.*—The root is composed of many thick fleshy fibres, diverging from the same head, striking deep into the ground, and putting out many smaller fibres, which are white and fleshy; from the same head arises a cluster of leaves surrounding each other at the base, so as to form a kind of herbaceous stalk about three inches high, from which the leaves spread only two ways, appearing flat the other two. The leaves are thick, succulent, about a foot long, and near an inch

broad, compressed, and of a dark green. Between these comes out the flower-stalk, from two to three feet in height, round, hollow, naked to the top, where it supports a large head or umbel of blue flowers, inclosed in a sheath, which splits into two parts, and is bent back. Each flower stands on a pedicel about an inch long. The petals are blunt, and waved on their edges. The umbel being large, the flowers numerous, and of a bright blue color, make a magnificent appearance. They come out at the end of August, or the beginning of September, and frequently continue in beauty till spring. A native of the Cape of Good Hope, from whence it was brought to the gardens in Holland. In 1692, it was cultivated in the royal garden at Hampton Court.

This plant is propagated by offsets, which come out from the side of the old plants, and may be taken off the latter end of June, at which time these plants are in their greatest state of rest; when the plants should be turned out of the pots, and the earth carefully cleared away from the roots, that the fibres of the offsets may be better distinguished, which should be separated from those of the old roots, being careful not to break their heads. But where they adhere so closely to the old plant, as not to be so separated, they must be cut off with a knife, taking great care not to wound or break the roots of either the offsets or the parent plant. When these are parted, they should be planted each into a separate pot, filled with light kitchen-garden earth, and placed in a shady situation, where they may enjoy the morning sun, giving them a little water twice a week, if the weather prove dry; but they must not have too much wet, especially at this season, when they are almost inactive; for as the roots are fleshy and succulent, they are apt to rot with great moisture. In about five weeks time the offsets will have put out new roots, when the pots may be removed to a more sunny situation, and then they may have a little more water, which will strengthen their flowering, but it must not be given them too liberally, for the reasons before given. In September, they will put out their flower-stalks, and toward the end of that month the flowers will begin to open, when, if the weather should not be good, they should be removed under

shelter, to prevent the flowers from being injured by frost or too much wet; but they should have as much free air as possible, otherwise the flowers will be pale-coloured and weak. Toward the end of October they should be removed into the green-house, and placed where they may enjoy as much free air as possible, and not be over-hung by other plants; and during the winter, they may have a little water once a week or oftener in mild weather, but in frost they should be kept dry. This plant only requires protection from frost and moisture, it should not therefore have any artificial warmth in winter, and must be placed in the open air in summer.

[2. *AGAPANTHUS PRÆCOX* (small flowered African lily). Bot. Cab. t. 42. *Peduncles twice as long as the corolla; leaves incur.* It differs from the *A. umbellatus* Loth in leaves and flowers. The whole plant is much smaller. The flower stem seldom attains a greater height than about a foot; the blossoms are much fewer in number, the leaves also are few, short, and stand almost erect. A native of the Cape of Good Hope. Introduced in 1816.

It is of easy culture and may be propagated by parting the roots, which should be potted in loam and peat, and protected from frost.

AGARICUS (from *Agaria*, a river of Sarmatia, the generic name by which all the species of mushrooms are collectively known).

Class 24. Cryptogamia. Nat. Ord. *Fungi*.

The characters are—*Pileus or cap of a fleshy nature, supported upon a distinct stalk; gills underneath, differing in substance from the rest of the plant, and inclosing the particles by which the species are re-produced, called sporules or seeds.* This genus consists, according to the latest botanical writers, of not fewer than a thousand species, inhabiting heaths, rocks, meadows, trees, and some masses of decaying vegetable matter, throughout Europe, and other parts of the temperate regions of the globe. A large proportion are poisonous, a few are wholesome, but by far the greater number are altogether unknown in regard to their action upon the human constitution. It would appear that their properties depend more upon climate, situation, and other for-

titious circumstances, than upon any specific characters, as some kinds that are wholesome in one country are not so in another. In England, *Agaricus muscarius* is extremely poisonous, whilst in Kamtschatka it constitutes a species of food. In many parts of Europe, several other sorts are eaten, which we fancy to be poisonous. Caution is certainly needful where several of the species are confessedly injurious, at least when taken in large quantities; and in order to distinguish the eatable from the poisonous species, observe the following characters, which are, without doubt, indicative of the poisonous sorts. Those that have a cap very thin in proportion to their gills.—Those in which the gills are all of equal length.—Those that run speedily into a dark watery liquid.—Such as have the stalk growing from one side of the cap, and those that have a milky juice. In Dr. Withering's *Botanical Arrangement*, the number of British species ascertained and described, amount to two hundred and thirteen; of all these one only, the *Agaricus campestris* has been selected for cultivation in our gardens. A few others, which will be hereafter described, may be eaten with perfect confidence.

Some of the species shine like so many focuses of cinnabar-light on the surrounding green, and are no small ornament in the solitary walks of the woods about the middle of October. They attract the eye to look at, the hand to pluck them, the mind to admire their beauty; but woe to him who eats them! They are pernicious, and confirm the melancholy axiom, that fair appearances are too often deceitful.

The *mushroom* differs from all others in many and essential points. The manner in which it is re-produced has been hitherto concealed from the intelligence of man; hence the denomination of *Cryptogamous*, given to the whole order. Reasoning, founded upon analogy, will naturally show that *mushrooms* must arise from the distension of some sort of seed; but this seed is so evanescent, so imperceptible, that it baffles the most strenuous microscopical effort; and yet from it will often be produced a plant, the weight of which is sometimes more than two pounds. Of the existence of this seed, although

it is imperceptible, we can have no doubt.

As it is generally in the silence and obscurity of night that the *mushroom* makes its appearance, the solemnity and awfulness of the time, appointed for its birth, has been taken hold of by the busy mind of superstition; and thousands of tales have been invented, repeated, and consequently believed, in all ages, and in all countries, relative to the origin and habits of this mysterious child of moisture and darkness. The appearance is so very sudden, that the growth of the plant must be uncommonly rapid; so much so, that it might almost be perceptible to the eye. A *mushroom*, two inches in height, and an inch in breadth on the cap, is often produced in less than three hours! No wonder, then, if the country people, whose romantic minds thirst credulously after every thing that borders upon prodigy, and of a character supernatural, have constantly, and in all countries, connected the birth of the *mushroom* with the fables of the fairies.

Without the ornamental pomp of leaves or the fastnings of roots, the *mushroom* is a little being by itself, and widely different from all other plants. It has a shield, an umbrella, a cap, a hood of various forms, according to the species to which it belongs. Its livery also may be looked upon as a fair mark of distinction; and when the approach of winter has despoiled the trees of their luxuriant boughs, and withered the transitory honours of Flora, the *mushroom* then, with its variety of dyes and whimsicality of shapes, bursts forth from the ground to adorn the widowed green of the meadows, or the bare sides of the brown hills.

Its habits of solitude, however, do not prevent a certain tendency to social intercourse, for they are generally gregarious, and sometimes so closely united, that they seem to hold to each other by the lower part of their stems. How admirable also is that curious union of individuals of the same family! Do they seek for security in combining themselves in a union so intimate, that their congregated heads represent the well known *testudo* of the united bucklers? Do they feel more happy in this disposition, or are the drops of rain from above, or of dew from beneath, better received or glanced off by this

curious contrivance? Seldom do we meet with a single and solitary *mushroom* in any part of the field. If not closely arranged, they are scattered at small distances from each other, and the families keep in distinct hordes, seldom intermixing with individuals of others; as if the hand of Nature had dipped in several baskets of various seeds, and had dropped here and there a small portion of each. *Mushrooms* are by many persons supposed to be produced from the putrefaction of the dung, earth, &c., &c. Pliny was of opinion that they owed their origin to trees, *fungorum origo ex pituita arborum*. They seek so constantly the neighbourhood of trees, that one might fancy they hold still some connexion with the fair Hamadryads of the old mythology. They thrive best under the extensive shade of their boughs, and when these sturdy sons of the earth have yielded to the axe and the saw of the woodman, the *mushroom* family gather themselves in mourning groups, upon the half-buried root, and seem to deplore the loss of their friends, at the very place where once they obtained protection and shelter. If once wrenched from the alimentering soil, no substitute can be found; though placed in water as a plucked flower, or transplanted as any sprout, the *mushroom*, far from thriving and expanding itself, sulkily droops, withers, and dies, as if indignant at having been disturbed from the state of silent, secret, and peaceful obscurity, in which it had been placed, and as if conscious, that an humble and unknown situation is much less exposed to dangers from ambition and envy, than an exalted one.

Much has been said as to the poison of *mushrooms*, but there seems to be no certain account of any person ever having been injured by eating the common *mushroom*, unless by eating too many at once, and thereby over-loading the stomach; or by their being eaten by persons who had a particular dislike to them. If this *mushroom* had any poisonous quality, it must have been found out by the doctors in such a place as London, where there are annually such vast quantities of them consumed; yet nothing of the kind is observed: indeed there is nothing at all hurtful in this species, though there are many others truly poisonous.

The ancients took great pains to distinguish the several kinds of *mushrooms*, that the world might know the hurtful from the safe. The *boletus* mentioned by Juvenal, on account of the death of the Emperor Claudius, is sufficiently described by Pliny, and is the *Agaricus Cæsareus*, (or *imperial Agaric* or *mushroom*). Clusius, among the moderns, has described a vast number of different species, every where distinguishing the esculent and wholesome from the poisonous or pernicious kinds. The several authors who have treated of them since the time of Clusius, have all mentioned the effects of some or other of the poisonous kinds; and there are numerous instances of the mischief done by them at one time or other. Some have been willing to ascribe this mischief to animalcules inhabiting the plant; but this seems erroneous, and particularly from the following instance: we have one kind of *mushroom* growing in England, called the *white acid fungus*, this is so extremely sharp, that it stimulates the tongue, as if it had been touched with spirit of nitre; and Tournefort observes, that if rubbed on blue paper it turns it red, in the same manner as that liquor, or any other of the violent acid spirits would: this caustic quality remains in the plant, even after drying. There is another kind, which is observed to kill the very flies as they settle upon it. It is not probable that such plants as these should be inhabited by any kind of animalcules, nor is it necessary to have recourse to such causes of the mischief which ensues from the eating them, when their own juices seem so well calculated to have occasioned it.

Mushrooms frequently grow to a very large size, some have been gathered that measured twenty-seven inches in circumference, upon a stalk of two inches and a half in diameter, and which together weighed twenty ounces. Mathioli mentions *mushrooms* which weighed thirty pounds each, and were as yellow as gold. Fer. Imperatus tells us, he saw some which weighed above a hundred pounds each; and to add one more quotation, the *Journal des Savans* furnishes us with an account of some growing on the frontiers of Hungary, which made a full cart-load.

Some very wonderful, almost incredible accounts, have been lately given

of the extraordinary force of vegetation in the *mushroom*. The following was communicated to the *Monthly Magazine*, and signed "Joseph Jefferson, Basingstoke:"—"A few weeks ago, one of the large flag-stones, in the new pavement of the town of Basingstoke, was observed to have risen about an inch and a half above its proper situation: on taking up the stone, a large *mushroom*, of six or seven inches diameter, was found growing beneath it; which some persons, strangely enough, imagined must have been the cause of raising up the stone in that manner. The stone-mason, who has the contract for the work, rather vexed that any should think a feeble *mushroom* had displaced his strong pavement, had the stone replaced in a secure manner; observing, that it should be safe enough for the future. About a month afterwards, (a few days ago,) the adjoining stone was observed to be displaced in the same manner as the former: on taking up the second stone, to the surprise of many witnesses to the fact, two *mushrooms*, not quite so large as the former, were found growing beneath it. The stones are nearly of the same size, each about twenty-four inches by twenty-one, and two inches in thickness; the latter, having been weighed, is eighty-three pounds." Some men employed in Mr. Haskell's brewery, in the Isle of Wight, in September 1826, observed a large stone to rise considerably at the interstices, and upon removing the pavement to discover the cause, found it to be occasioned by a large *mushroom*, the vegetative powers of which had forced the stone from its proper station. However surprising and incredible these accounts may appear, the matter of fact is most certain, and certainly deserves the consideration of philosophers and naturalists.

The only eatable kinds that can be safely employed in Great Britain, are the *Agaricus Campestris*, *Agaricus Georgii*, and *Agaricus Orcades*.

1. *AGARICUS CAMPESTRIS* (common mushroom). Grev. Crypt., t. 161. The gills are loose, pinky red, changing to a liver-colour, in contact with the stem, but not united to it; very thick set, irregularly disposed, some forked next the stem, some next the edge of the pileus, some at both ends, and in that case generally excluding the intermediate smaller gills;

the pileus is white, changing to brown when old, and becoming scurfy, regularly convex, fleshy, flatter with age, from two to four inches, and sometimes nine inches in diameter, and liquifying in decay; the flesh white; the stem is solid, white, cylindrical, from two to three inches high, half an inch in diameter; the curtain white and delicate.—This species is the *Mosses* *ladinus* of Dioscorides, the *Callus rubens* of Pliny, and the *Prateolus* of Cæsalpin. Mushroom may be derived from the French *mousseron*, which is from *mousse*, moss. But it is very remarkable, that what the French call *mousseron*, is the small white sort which we call *champignon*; and what they call *champignon* is really our common mushroom—*agaricus campestris*—as if it had been done for the cruel purpose of puzzling the respective foreigners in the two neighbouring kingdoms. It is esteemed the best and most savoury of the genus, and is in much request for the table in England. It is eaten fresh, stewed or broiled, and preserved either as a pickle or in powder; the sauce, vulgarly called *catsup*, is made from its juice with salt and spices. It is generally considered that wild mushrooms are more delicate than those raised on artificial beds; those who are much accustomed to them, can immediately tell the difference by the smell. Those artificially raised are certainly more sightly, and more easily procured in a proper state for eating; they are also firmer and better for pickling.

The true eatable mushroom is distinguished from the poisonous and unpleasant kinds by these marks:—when it first makes its appearance, it is smooth and almost globular; the edges of the hat press upon the pillar, and the gills, which are then almost white, and covered with a white membrane extending from the edge of the hat, to the summit of the pillar. In this state it is called a *button*. By degrees it expands; the membrane bursts, and the edges of the hat recede from the pillar. The gills are then exposed to view, of a bright fresh colour, which, however, soon fades, and sinks at length into a dark brown chocolate colour. The hat now loses its convexity, and becomes almost flat, rough, and scaly. The wild mushrooms are found in parks and other pastures, where the turf has

not been ploughed up for many years; and the best time for gathering them is August and September.

The following test, whereby to try the quality of mushrooms, is given in the *Encyclopædia Britannica*: Take an onion, strip the outer skin, and boil it with your mushrooms; if the onion becomes blue or black, there are certainly dangerous ones amongst them; if it remain white, they are good.

The common mushroom is found throughout the whole of Europe, even in Lapland; as far as Japan, in Asia, in Africa, (Barbary) and in America. In France, where a number of different kinds of *fungi* are constantly consumed as regular articles of diet, this species goes by the following names: *Paturous*, *Potirous*, *Euvinassas*, *Champignons des pres*, *C. du fumier*, *C. delouche*, &c. Its most common name is *champignon*. It is, indeed, nearly impossible to form an idea respecting the almost incredible extent to which the eating of *fungi* is carried there, and in different parts of Europe.

2. *AGARICUS GEORGII* (of Linnæus), much resembles the *campestris*, but is far inferior to it in flavour, though not poisonous as generally supposed. It is very common, the cap turns yellow, but the gills are always white. The stem yellow, thickish, and smooth; the juice yellow, which flows plentifully when wounded. It is gathered in September, in woods and pastures. *Agaricus Georgii* derives its name, according to Parkinson, “from springing up about the time of St. George’s Day.” Dr. Greville says, “it is unquestionably the largest of the British *Agarics*. It has been known to weigh fourteen pounds.” Mr. Hopkirk mentions one that weighed five pounds six ounces, and measured forty-three inches in circumference; but Mr. Stackhouse found it to attain the enormous size of eighteen inches in diameter, which is more than fifty-six in circumference, having a stem as thick as a man’s wrist. The best distinguishing marks are, the extreme paleness of the lamellæ at the period of the bursting of the veil, compared with the true mushroom; the greater convexity and thickness of the flesh at the same period; and shortly afterwards, the more yellowish and tough pileus or cap.

A variety of this species is found on the sea-coast of Cornwall of a large size,

with the button as large as a potato; the expanded *pileus* eighteen inches over, the stem as thick as a man's wrist, the gills very pale, the curtain tough, and thick as leather, and the juice yellowish. A plant of this kind, as Dr. Withering informs us, was gathered on an old hot-bed in a garden in Birmingham, which weighed fourteen pounds.

3. *AGARICUS ORCADES, OR PRATENSIS* (fairy-ring mushroom). *Has loose gills, with the part attached to the pileus jutting up very close to the stem, so as to give them almost the appearance of being fixed; watery, brownish white.*—This small pale-brown or buff-coloured mushroom is very frequent in dry pastures, and particularly in those patches called *fairy rings*, which Dr. Withering is satisfied are entirely produced by their growth; for where the ring is brown or almost bare, upon digging up the soil to the depth of two inches, the spawn of this fungus will be found of a grayish white colour; but where the grass has again grown green and rank there is no spawn. It is also found in woods and hedges, but is then inferior in flavour. Those from dry pastures are the best, have a pleasant smell, and a most luscious flavour, either stewed alone, or in hashes and ragouts. They make excellent *catsup*, and are admirable in the form of a powder. Professor Martyn informs us, that he has eaten these mushrooms for forty years without injury, and without perceiving that toughness, like leather, of which others have complained; except in very dry weather, or when they are in too advanced a state. They should be gathered young and early in the morning, and properly dressed. It is in season during September and October, but may be so dried as to be in use for the table all the winter. Mr. Ray calls this species *fairy ring Agaric* or *Scotch bonnets*.

Mr. Lightfoot supposes that this species is the *mousseron* of the French, who use it in ragouts, instead of *campestris*, and acknowledge it to be equal in flavour, but more tough. The *mousseron*, however, has a very thick and fleshy *pileus*; its gills are very narrow and numerous, and fixed to the stem, which is thick and short.

4. *AGARICUS CÆSAREUS* (or imperial mushroom), is the most splendid of all the species. Its gills are fixed, of a

bright golden yellow, and nearly orange under the edge of the *pileus*. They are regularly disposed four in a row; the *pileus* is a fine lake red, changing with age to a rich orange and buff, and every intermediate shade of those colours, which renders it very beautiful. It is common in Italy, where it is exposed in the markets for sale. The ancient Romans esteemed it one of the greatest luxuries; and Juvenal and Martial have celebrated it as the vehicle whereby Claudius Cæsar was poisoned by his wife Agrippina. It is eatable, but its taste is not at all agreeable. It was first found wild in this country by Dr. Withering's daughter, on the red rock plantations at Edgbaston, July 6th, 1791; and afterwards in September, 1793; and in July, 1792, amongst moss in the fir-plantations at Tattenhall, Staffordshire. Dr. Withering enumerates five varieties.

5. *AGARICUS DELICIOSUS* (delicious mushroom). *Has gills decurrent, flame-coloured, narrow, regularly branched; pileus rich red brown; flesh nearly flat, but somewhat hollowed at the centre and the edge turned in, from one and a half to three inches over; orange-colour; stem orange, solid, tapering downwards, from one to two inches high, and a quarter to three-eighths inch diameter; hollow with age; the juice is rich yellow, which soon turns green.*—It is found in the fir-plantations of Scotland, and in those of the barren hills at Barr, in Staffordshire. Dr. Smith also found it at Hillingdon, Middlesex, under some fir-trees, and it also grows near Guildford. It is much esteemed in Italy, and exposed in the markets, and supposed to have been the *Agaricus Cæsareus* mentioned by the authors cited under the preceding article. Dr. Withering enumerates three varieties, one of which affords, from every part of it when wounded, a copious discharge of yellow acrid juice. They are gathered in woods and dry pastures in September and October.

6. *AGARICUS CINNAMOMEUS* (cinnamon mushroom). *Has gills, four in a set, broad about the middle, deep tawny red, and fixed by claws; pileus convex but bossed, of a rich cinnamon colour, from one and a half to three and a half inches diameter; the stem hollow, cylindrical, silky, shining, two inches high, thick as a goose quill, of a fine full yellow colour.*

—This is a species that is readily distinguished by its cinnamon-colour. It is found in woods in September and October, and has a good flavour.

7. *AGARICUS BULBOSUS* (bulbous mushroom). *Has white, loose, irregular gills; pileus convex, white, smooth, sometimes fringed at the edge; four or five inches over; flesh white, spongy and very thick; stem solid, cylindrical, smooth, white, four inches high, and half an inch or more in diameter; ring permanent, broad and white.*—This species possesses all the parts belonging to the genus, and is well adapted to instruct the learner in understanding them. It is found from spring to the end of autumn in rich soils, and also in gardens, on the sides and at the base of hot-beds. Dr. Withering enumerates four varieties, found in woods about the roots of trees, and in pastures. In maturity, it plentifully emits a powder of the colour of Spanish snuff. It is not uncommon from October to December, in Edgbaston and Barr plantations, in the woods near Bath, and at Powick, near Worcester. Broiled and duly seasoned, it is esteemed as delicious as an oyster.

8. *AGARICUS CHANTARELLOS.* *Has its stem solid, often compressed; gills decurrent, branched.*—It may be safely eaten, but it is more tough and less highly flavoured than some of the preceding species.

9. *AGARICUS PROCERUS* (or tall mushroom).—Is not uncommon on hedge-banks and dry pastures, and is sometimes exposed to sale in Covent Garden Market. It may be distinguished from the genuine sort by the sponginess of its flesh, and from all others by its tallness, bulbous base, and by its fine large horizontal ring or ruffle. This plant, when preserved in pickle, is apt to run into the vinous fermentation.

10. *AGARICUS PIPERATUS* (peppery mushroom). *Has gills, pale, yellow, pinky, red, numerous in pairs; pileus dirty yellow white, woolly, depressed in the centre; stem pale yellow.*—This plant and its varieties, is met with in many parts of Europe, and though the most acrid and suspicious of all the *Agarics*, is eaten in great quantities by the Russians. They fill large vessels with them in the autumn, season or pickle them with salt, and eat them the

ensuing Lent. It is much eaten by insects and snails.

11 *AGARICUS MUSCARIUS* (fly agaric). *Has a large pileus, varying much in colour, white, red, or crimson; convex sprinkled with downy warts, two to seven inches over.*—This plant rises out of the ground inclosed within its brown studded wrapper. It is found in pastures. The juice rubbed on walls and bed-posts destroys bugs; and in the north of Europe the inhabitants infuse it in milk, and set it in their windows, in order to poison the flies which taste it. This is the *moucho-more* of the Russians, Kamtschadales and Koriars, who use it for intoxication. They sometimes eat it dry, and sometimes immerse it in a liquor, made with the epilobium; and when they drink this liquor, they are seized with convulsions in all their limbs, followed with that kind of raving which attends a burning fever. They personify this mushroom, and if they are urged by its effects to suicide, or any dreadful crime, they pretend to obey its commands. To fit themselves for premeditated assassination, they recur to the use of the *moucho-more*. These fungi are collected in the hottest months, and hung up by a string in the air to dry; some dry of themselves on the ground, and are said to be far more narcotic than those artificially preserved. Small deep-coloured specimens, thickly covered with warts, are also said to be more powerful than those of a larger size and paler colour. The usual mode of taking this fungus, is to roll it up like a bolus, and swallow it without chewing, which the Kamtschadales say would disorder the stomach. It is sometimes eaten fresh in soups and sauces, and then loses much of its intoxicating property. One large, or two small fungi, is a common dose to produce a pleasant intoxication for the whole day, particularly if water be drank after it, which augments the narcotic principle. The desired effect comes on one or two hours after taking the fungus. Giddiness and drunkenness result in the same manner as from wine or spirits. Cheerful emotions of the mind are first produced; involuntary words and actions follow, and sometimes (at least) an entire loss of consciousness. It renders some remarkably active, and proves

highly stimulant to muscular action; by too large a dose, violent spasmodic effects are produced. So very exciting to the nervous system, in some individuals, is this fungus, that the effects are often very ludicrous. If a person, under its influence, wishes to step over a straw or small stick, he takes a stride or a jump sufficient to clear the trunk of a tree; a talkative person cannot keep secrets or silence; and one fond of music is perpetually singing.

A powder of the root, or of that part of the stem which is covered by the earth, is recommended in epileptic cases, and externally applied for dissipating hard globular swellings, and for healing ulcers. The dose is from half a scruple to one, taken three times a day in water; but a dram, administered once a day in vinegar, has been thought more efficacious. Dr. Withering enumerates ten varieties of this species.

The nature of this work does not require that we should enter more minutely into the consideration of the *Agarics*. The bare enumeration and description of the species would make a large volume. Those who have curiosity and courage to adventure on determining the qualities of others of this family, may consult the works of Persoon, Withering, Decandolle, &c., &c., in which they will find ample information. But before commencing their experiments, we would recommend to their attention the following circumstance, related by Dr. Lindley.

A lieutenant in the French army, ate some mushrooms, supposed to be of a wholesome kind, at ten in the morning; at seven in the evening he was attacked with severe colic; at ten his wife began to experience the same sensations, attended with nausea. In the course of the night they were both attacked with violent vomiting and purging, accompanied by intense thirst. This was succeeded by severe cramps, and the pulse became hard, weak, rapid, and irregular. At ten the next morning the husband died, and the wife at six in the evening. But the person from whom the *Agarics* had been procured, as well as all his family, had eaten abundantly of them without inconvenience. Upon a careful inquiry, it appeared that the latter had well salted, then boiled for some time, and after-

wards pressed the *Agarics* before eating them—precautions which the unfortunate lieutenant had neglected.]

In order to cultivate *mushrooms*, if there be no bed in your own, or neighbouring garden, which produce them, you should look abroad in rich pastures, during the months of August and September (that being the season when they are naturally produced): then you should open the ground about the roots of the *mushrooms*, where you will often find the earth full of small white knobs, which are the offsets, or young *mushrooms*: these should be carefully gathered, preserving them in lumps with the earth about them. This spawn cannot be found in the pasture, except at the season when the *mushrooms* are naturally produced; but you may probably find some in old dunghills, especially where there has been much litter, and the wet hath not penetrated to rot it; as likewise, by searching old hot-beds, it may be often found. It has the appearance of a white mould, shooting out in long strings, by which it may be easily known wherever it is met with: or it may be procured by mixing some long dung from the stable, which has not been thrown on a heap to ferment with strong earth, and put under cover to prevent wet getting to it; the drier it be kept the sooner the spawn will appear, but this must not be laid so close together as to heat, for that will destroy the spawn. In about two months after the spawn will appear, especially if the heaps be closely covered with old thatch, or such litter as has lain long abroad, so as not to ferment, then the beds may be prepared to receive the spawn: these beds should be made of dung, in which there is good store of litter, but should not be thrown on a heap to ferment; that dung which hath lain spread abroad for a month or longer, is best. The beds should be made on dry ground, and the dung laid upon the surface; the width of the beds at bottom should be about two feet and a half or three feet, the length in proportion to the quantity of *mushrooms* desired; then lay the dung about a foot thick, covering it about four inches with strong earth. Upon this lay more dung, about ten inches thick; then another layer of earth, still drawing in the sides of the bed, so as

form it like the ridge of a house, which may be done by three layers of dung and as many of earth. When the bed is finished, it should be covered with litter or old thatch, to keep out wet, as also to prevent its drying; in this situation it may remain eight or ten days, by which time the bed will be in a proper temperature of warmth to receive the spawn; for there should be only a moderate warmth in it, great heat destroys the spawn, as will also wet; therefore, when the spawn is found, it should always be kept dry until it is used, for the drier it is, the better it will take in the bed. I had a parcel of this spawn once, which had lain near the oven of a stove upwards of four months, and was become so dry, that I despaired of its success; but I never have yet seen any which produced so soon, nor in so great quantity.

The bed being in a proper temperature for the spawn, the covering of litter should be taken off, and the sides of the bed smoothed; then a covering of light rich, but not wet earth, about an inch thick, should be laid all over the bed; upon this the spawn should be thrust, laying the lumps four or five inches asunder; then gently cover with light earth above half an inch thick, and put the covering of litter over the bed, laying it so thick as to keep out wet, and prevent the bed from drying: when these beds are made in the spring or autumn, as the weather is in those seasons temperate, so the spawn will then take much sooner, and the *mushrooms* will appear perhaps in a month after making; but those beds which are made in summer, when the season is hot, or in winter, when the weather is cold, are much longer before they produce.

The great skill in managing of the beds is, in keeping them in a proper degree of moisture, never suffering them to be too wet. During the summer season the beds may be uncovered, to receive gentle showers of rain at proper seasons; and in long dry summers, the beds should be now and then gently watered, but by no means suffer much wet to come to them. During the winter season they must be kept as dry as possible, and so closely covered as to keep out cold. In frosty or very cold weather, if some warm litter, shaken out of a dung heap, be laid on,

it will promote the growth of the *mushrooms*; but this must not be laid next the bed, but a covering of dry litter between the bed and this warm litter; and as often as the litter is found to decay, it should be renewed; and, as the cold increases, the covering should be laid so much thicker. If these things are observed, there will be plenty of *mushrooms* produced all the year, and of a much better sort than those gathered in the fields.

From these beds, when they are destroyed, you should take the spawn for a fresh supply, which may be laid up in a dry place until the proper season of using it, which should not be sooner than five or six weeks, that the spawn may have time to dry before it is put into the bed, otherwise it will not succeed well.

Sometimes it happens, that beds thus made do not produce any *mushrooms* till they have lain five or six months, so that these beds should not be destroyed, though they should not at first answer expectation; for I have frequently known these to have produced great quantities of *mushrooms* afterward, and have continued a long time in perfection.

[The accompanying Plate, 12, represents the ground plan and section of the *mushroom* house at Woburn Abbey, which is similar to what is generally used in Germany for the culture of this vegetable; it was introduced into this country by Mr. Oldacre, gardener to the late Sir Joseph Banks, and is undoubtedly the most successful means of bringing the *mushroom* to perfection during the winter months. The dimensions of this house are seventy feet by ten in the clear; the height of the front wall is about eight feet, and that of the back twelve feet. In this house there are rows of beds along the front wall, which are about four feet square each; the partitions which divide the beds in the lengths, consist of brick-work, and the shelves are supported by cast metal bars. There are also two tiers of beds that run along the back, as is indicated in the section, which are supported by cast metal bars, similar to those of the front. Along the floor of this house, immediately under the first tier of shelves, a quantity of dung or leaves is introduced, which assists in keeping up a

moist heat in this department, and renders less fuel necessary.

The best material for the beds are horse-droppings, and short litter recent from the stables; to these may be added a small portion of sandy loam, which will better cement the other materials together. Dung from the ride of a livery stable, or the round of a horse-mill, will be found superior for the production of *mushrooms* to that gathered from the stables: these ingredients must be spread on the floor of the house for a few days to dry, so that the moisture may evaporate before the materials are formed into a bed. When the ingredients appear to be in a moderately dry state, they may be formed into a bed, observing to beat them as compactly together as possible to the thickness of eight inches: a mallet should be used for this purpose, in order that every part of the beds may be rendered into a compact solid substance. These beds should not be made of a greater thickness than that specified, otherwise they will be subject to a strong fermentation, which will rot the materials, and render them less congenial to the vegetation of the spawn. If, on the other hand, they are made up of much less substance, they will not afford that degree of nourishment which is requisite for the maturity of the *mushroom*. When the beds appear a little more than lukewarm, which may be ascertained by placing a thermometer in the dung, and when this indicates from 80 to 90 deg., the beds should be again beat, so that every part may be made as compact and solid as it will admit; it is upon the solidity of the materials, and proper fermentation, that the success of a crop depends; as soon as the heat is as great as above-mentioned, there should be a number of holes, about three inches in diameter, and from seven to nine inches apart, made all over the surface of the beds. These holes will be the means of tempering the bed, and preventing a too strong fermentation taking place, which would render the beds unproductive; they are likewise intended for depositing the spawn, which may be put in three or four days after they are made, providing the temperature does not exceed 80 or 90 deg.; the spawning of the beds should be performed when the

heat is on the decline, as if done, when in a strong degree of fermentation, the spawn would be injured and rendered abortive. This operation must not, however, be deferred until the heat is too much subsided. When the beds appear in a proper state for spawning, the holes previously made in them should be well crammed with the spawn, and their surface levelled, and left in this state until the spawn is beginning to vegetate, when they should be covered all over with light dry sandy loam, to the depth of two inches. Should the surface of the beds appear to get too dry for the running of the spawn freely, a sprinkling of water should be given occasionally; but observe not to give much at a time, for fear of saturating or rotting the spawn. The *mushrooms* will generally begin to make their appearance in the course of seven or eight weeks after the spawn is deposited in the beds, and will continue to produce good crops for several weeks: the successions must be kept up by the making of fresh beds as they appear to be required, which will prolong the season from November until they can be procured in the open air.

The Rev. Wm. Williamson, in a communication to the Horticultural Society, read October 7th, 1817, observes that the method of raising *mushrooms* by means of a stove, being so expensive as to be out of the reach of most, recommends a more economical mode, which can be put in practice by any one, who is in the habit of raising either *cucumbers* or *melons*.

Having made the *melon-bed* in the usual manner, when the burning heat is over, and the bed is ready to be earthed to a sufficient thickness, place spawn on the sides of the hills, and also on the surface of the bed, and then cover the whole with mould as usual, managing the *melons* exactly in the same manner as if the spawn were not there, not omitting even to tread it, as the compact loam is more congenial to the growth of the *mushroom*, than the light rich compost of the *cucumber-bed*. The heat will soon cause the spawn to run, and extend itself through the dung, to the surface of the ground. In September or October following, when the *melon-bine* is decaying, the bed should be carefully cleaned, the glasses

put on, and kept close; when the mould becomes dry, it must be frequently watered. The moisture coming up on the dry earth, produces a moderate heat, which soon causes the *mushrooms* to appear in every part of the bed, in such abundance as even to prevent each other's growth, frequently producing at one time two bushels from a frame ten feet by six, and some of them so large as to weigh nearly two pounds.

The catsup extracted from *mushrooms* raised by the above method, is much superior to that commonly obtained from *mushrooms* produced naturally; it is extremely high-coloured and of a much finer flavour.

Mr. Jeeves has applied the pit of a small stove (formerly used for forcing flowers) to the raising *mushrooms*. The dung was placed in the bottom of the pit, and rammed tightly down to about the thickness of eighteen inches, the dung itself producing sufficient heat to set the spawn running, after it had been introduced in the usual manner; the bed was made up in September, and came into bearing in six weeks; continuing to produce regularly throughout the winter. On very frosty nights, a little fire was put into the flue. The *mushrooms* came up uniformly over every part of the bed, which was covered with straw (not sufficient to exclude the light), for the purpose of preserving moisture on the surface.

When a daily supply is not wanted, a method of raising *mushrooms* might be adopted, and a sufficient quantity for a small family obtained by putting the dung and spawn into boxes of such a size as might be conveniently placed on the shelves, or other parts of green-houses or conservatories.

Mushrooms may likewise be produced in a cellar, or any other vaulted place, with equal, and sometimes greater success as to crop, than in a shed or other building that is level with the surface of the earth. The same rules of management are to be observed as directed for the shed. The peculiar advantage of a cellar, is, that no fire is necessary, and less water, the application of which so frequently proves injurious.

It is easy to grow *mushrooms* in the autumn, when the atmosphere is congenial to their growth; but for summer and winter produce, the delicate habits

of the *mushroom* require a nicety of management which few have been able to attain; and those who are best acquainted with the raising them, well know how difficult it is to obtain a supply through all the seasons of the year. The uncertainty in cold beds has arisen from the want of bottom heat, and from damp; in houses warmed by fire-flues, it may be attributed to the arid state of the atmosphere. As *mushrooms* disappear in the fields for the season, after a single sharp frost, so it will be found difficult to recover a bed after it has once suffered any severe check. From attentively considering the habits of this vegetable in its natural state, and the causes of the frequent failure in obtaining crops, Mr. Callow, in his *Work on Mushrooms*, recommends the abandonment of the most uncertain dung-ridge culture, and also the use of fire-heat, and the substitution of the steam of hot dung in the *mushroom* house, thus forming an atmosphere somewhat resembling that of those close foggy mornings, which the uneducated husbandman, from merely observing effects, calls "Mushroom Weather." A damp heated atmosphere seems to be the desideratum to insure luxuriant crops throughout the year. Let the house for summer use face the north or north-east; for winter use the south or south-west. If the soil be wet, use the proper means to render the floor of the house perfectly dry. Build the back and ends of stone or brick, the front of inch board, plastered inside, and cover the roof with a thick coat of thatch. Leave an opening at each end for the admission of air at pleasure. In the roof, form two or more windows of small size, for admitting light, when watering or doing other work. Form a small door-way in the centre of the boarded front. From thence to the back wall there should be a trench eighteen feet wide and two feet deep, to be filled with hot dung whenever it may be necessary to increase the heat and moisture of the house. Shelves may be placed against the back and end walls, and flues formed across the floor two feet deep by eighteen inches wide, covered with boards or flat stones, for receiving the steam of the dung; and other flues or vacuities may run along the ends and sides of the house at pleasure, by simply placing in an inclined posi-

tion, boards or flat stones against the walls. The bed in the floor of the *mushroom* house, and those on the shelves, are to be made of properly prepared dung in the usual manner, and the same as to the planting the spawn, &c. A uniform temperature is to be kept up in the house, by outside linings of fresh dung, leaves, or grass; raised either only a few feet in height, or as high as the eaves of the roof, as the season or other circumstances may require.

This very certain and economical mode of raising *mushrooms*, may be proved in any common pit, or even frame, only substituting thatched boards for the glass sashes.

Mr. Oldacre gives the following directions for breeding spawn for the *mushroom* beds: "To any quantity of fresh horse droppings mixed with short litter (as recommended for the beds), add one third of cow's dung, and a small portion of earth to cement it together; mash the whole into a thin compost, and then spread it on the floor of an open shed, and let it remain till it becomes firm enough to be formed into flat square bricks, which being done, set them on edge, and frequently turn them until half dry; then, with a dibble, make one or two holes in each brick, and insert in each hole a piece of good old spawn, the size of a *common walnut*; the bricks should then remain until they are dry. This being completed, level the surface of a piece of ground three feet wide, and of length sufficient to receive the bricks, on which lay a bottom of dry horse dung, six inches high; then form a pile by placing the bricks in rows one upon another (the spawn side uppermost), till the pile is three feet high; next cover it with a small portion of warm horse dung, sufficient in quantity to diffuse a gentle glow through the whole. When the spawn has spread itself through every part of the bricks, the process is ended, and they may be laid up in any dry place for use. *Mushroom spawn*, made according to this recipe, will preserve its vegetative power many years, if well dried before it is laid up; if moist, it will grow, and soon exhaust itself."

AGATHOPHYLLUM (from *αγαθός*, good, and *φυλλον* a leaf. The leaf has a pleasant smell, like cloves, which is the

meaning of the Madagascar name, *Raven-tsara*).

Class II, 1. Monogynia. Dodecandria.

The characters are—*Petals six; calyx truncate; drupe one-seeded.*

AGATHOPHYLLUM AROMATICUM (aromatic raven-sara, or Madagascar nutmeg). Sonn. It., t. 127. *Leaves stalked, alternate, ovate, obtuse, coriaceous, entire, smooth.*—The *raven-sara* is a large bushy tree, with a pyramidal head like the *clove tree*, and a reddish odorous bark; the wood is hard, heavy, white, with some reddish fibres, and has no smell. Leaves alternate, simple, oval, entire, sometimes a little pointed, but more often obtuse, smooth on both sides, whitish and somewhat glaucous underneath, of a firm texture like those of the bay, with a strong longitudinal nerve; they are on petioles half an inch in length. Flowers extremely small towards the end of the branches, in several little panicles, one terminating, and two or three axillary; petals only half a line in length, with some short hairs on the outside. There is a single fruit at the end of each branch the size of a large cherry, shaped like a pear, with a roundish body; it consists of a nut divided into six parts, in the same manner as the *walnut* is into four, covered with a hard coriaceous shell, and that with a thin green shell or bark very closely adhering to it; both these are aromatic; but the nut has an acrid biting taste, which is almost caustic. This tree bears at five or six years' growth, and flowers in January and February. The fruit is ten months in ripening. The natives of Madagascar gather it before it is ripe, as a spice, for the purpose of seasoning their meat. It has a fine aromatic smell when fresh, and the caustic taste may be abated by keeping it some months, after which it may be thrown into boiling water for four or five minutes, and then dried in the sun. The leaves may be prepared as a spice, in the same manner. Introduced in 1823. May be increased by cuttings, which should be planted in a mixture of peat and loam, and plunged in the bark stove.

AGATHIS (from *αγαθός*, because the flowers are collected in clusters).

Class 21, 8. Monœcia Monadelphica. Nat. Ord. *Coniferae*.

The characters are—*Male—anthers*

many-celled; female—scales imbricated, in a round cone, naked at back, persistent, monogynous; pericarps winged, united to the inside of scale; cotyledons two.

1. *AGATHIS ORIENTALIS* (common dammar pine). Rumph. 2, t. 57. *Leaves elliptical, lanceolate, striated.*—This is a large tree found on the very summits of the mountains of Amboyna, Ternate, and in many of the Molucca Islands. Its timber is represented to be light and of inferior quality, wholly unfit for any situation exposed to wet, but answering moderately well for in-door purposes. When young it has something of the aspect of a young cedar, which it is said also to resemble in its wood. It is occasionally to be met with in this country in the hot-houses of the curious. The cuttings will strike readily by keeping them in a gentle bottom heat and a moist atmosphere. In Lord Grenville's magnificent pinetum at Dropmore, is a specimen of this species in a state of the greatest luxuriance. This species is, however, of little use, except for the resin.

Rumphius, in his *Herbarium Amboinense*, gives the following account of the resinous substance produced by this tree, which is well-known in India under the name of *Dammar-Puti*, *Dammar-Batu*, or *White Dammar*.

"The pellucid resin which flows from this tree is at first soft and viscous, but within a few days it becomes hard as stone, and has all the transparency and whiteness of crystal, especially that which adheres to the trees, and it will sometimes hang from them in the shape of icicles; that which flows to the ground, however, becomes black, and mixed with extraneous matter. These icicles (as they may be called) are sometimes as much as a palm in breadth, and a foot in length, and exhibit an elegant, striated appearance. For the first half year, the resin retains its white colour and transparency, but afterwards assumes a beautiful amber colour. It is brittle, and when broken, shines like glass. It is much harder than the sort known by the name of *Dammara Selanica*, and in some degree admits of being bent, but when pounded it is friable. The product of the male trees is more white and pellucid, but dries more slowly, and exudes in a smaller quantity, whence little or none is collected

from them. To force a supply of this substance, it is usual to make incisions in the lower part of the trunk with sharp knives. This occasions the formation of large knots in the wounded places, which protrude like heads, as in the *maple*, are covered with *dammar*, and put forth a number of branches.

"The peasants clear away the rubbish around the feet of the trees, and dig holes, in order to collect the *dammar* free from impurities; where the roots rise, bare out of the ground, however, they are made knotty by incisions, and yield resin like other wounded parts of the tree, becoming covered with a sort of white bark.

"The smell of fresh and soft *dammar* is perfectly resinous, but when dry this substance does not emit any particular odour; thrown on burning coals, it gives out a smell partaking of turpentine and mastich, as does also the taste, though the latter is somewhat like the *Canarium*. It is very inflammable, and burns longer than the *Dammar Selan*, but without any crackling, though it emits a great quantity of acidulous smoke, which produces a very unpleasant effect on those who are unaccustomed to it.

"As the common *dammar*, sold in the market, is white and semi-transparent, as well as that collected from the knots of the lower part of the trunk, so is the latter changeable in its colour, varying from a reddish to a horny, and even to a black appearance; it is, nevertheless, hard and pellucid, like the great masses and heads which hang from the thicker branches and oldest trees, for, as these cannot on account of their height be ascended, the masses hang on them the longer, and lose their original whiteness and become of a horny colour. This circumstance is particularly remarkable on the *dammar* trees about Way, whence I am led to believe that the variations of colour proceed from the difference of the time of year, or from the interval that the masses remain in their native situations.

"In the year 1688, I sent a piece of *dammar* to the University of Leyden, which, in its form, resembled the head of an infant, and by artificial means had been made to assume something like features; but the nose was very ugly, and there were red marks near it, resembling streaks of blood. I have also

in my own possession a large white semi-transparent mass, which resembles an immense ox's gall bladder. Some of the crystalline branches sent into Holland did not retain their colour, but became, there, of a sort of amber hue.

"The malay name of *Dammar-Puti*, and *Dammar Batu*, signifies *stone resin*, for it is the hardest of all the *dammars*, and approaches very near to the *gum animæ*. Among the Ternaats it is called only *Salo*, or *Salo Bobuda*; in Amboyna, *Camal Camar*, and *Cama*; about Larique, *Isse*; and about Grisecca, in Java, *Dama*.

"The medicinal uses of this resinous substance have not yet been discovered. Some of the people of Amboyna, however (but I own I would not, myself, be of the number), whose feet have been wounded with thorns, or splinters of wood, have no sooner extracted the latter than they have dropped into the punctured parts a drop or two of burning *dammar*, which has prevented the formation of an ulcer, and scarcely created any pain in the callous, hard soles of the Indians. This species of *dammar* is not easily liquefied, except by means of an admixture of Calapp oil, or common pitch. It is not found, however, to adhere well to the keels of ships, but is apt to fall off, and therefore does not answer the purpose of pitching; yet it deserves further trial, especially in a country where the want of pitch is attended with so much danger to navigation: other resins, indeed, will in some measure supply its place. To persons who write much (as clerks and secretaries), the *dammar* is of some use, for if they have occasion to scrape out a letter or a word, and will afterwards sprinkle a little of the powder on the place from which the erasure has been made, the paper is rendered smooth and susceptible of being again written on; but the letters soon become faint.

"The *Dammar Radja* (called by the Ternaats *Salo Calauo*) is the same resin as that above described, but only the largest and most transparent pieces, which hang from the upper part of the trunk, free from impurities. That which is found at Batsjana and Hallem-paera never turns yellow like the *Amboyna Dammar*, but is almost always white, and very gradually acquires any tinge of yellow; in taste and smell, however, it is the same, and collected

from the same kind of tree. This sort alone is employed by the kings of the Moluccas as a suffumitory, whence it obtains the name of *Royal Dammar*, and the common people are prohibited from using it.

"There is some amusement in observing people unacquainted with this substance, who, meeting with it in the shops, take it to be lump sugar; as it is sold at a very cheap rate, the purchasers seek out the first corner to enjoy a taste of it, but immediately discover their mistake.

"In books of voyages, we sometimes read of large quantities of mastich being found in these islands, but the substance alluded to is no other than the *Dammar Batu*, which, when burnt, emits the same smell."

2. AGATHIS AUSTRALIS (Kawrie pine). *Leaves orate, oblong, smooth, not striated.*—The *Agathis Australis* may justly be ranked as one of the finest timber trees which New Zealand produces, often rising to the amazing height of one hundred and forty feet, with a diameter near the base, of four to seven feet. Its trunk is straight and even-grained, rendering it very suitable for ship masts. The tree yields, both by incision and spontaneously, vast quantities of a pure and limpid resin, which soon hardens on exposure to the air. An extensive cabinet-maker has tried this resin in varnishing, and declares that it is equal, if not superior, to the best copal varnish. This valuable resin is deserving of attention, as an article of commerce.

The Horticultural Society were fortunate in obtaining a living plant of the *Agathis Australis*, which is now several feet high. It was brought home by Captain Downie, under whose order two ships were sent by Government some time ago, for the purpose of procuring timber fit for ship-building. The immense spars requisite for making the top-masts of the larger classes of ships in the navy, had become so extravagant in price, and so scarce in Europe, that it was necessary to look for them elsewhere. Captain Cook had mentioned in his voyage, that he thought the timber he had seen in New Zealand, if light enough, would make the finest masts in the world; persons, who subsequently visited the island had confirmed the opinion, and a small spar

which was brought from thence to England by the Catherine, whale ship, was much approved of, and purchased for a fore-top-gallant mast for the Dromedary. It was well tried during its return to its native country, and proved itself to be, in seaman's phrase, a *stick* of first rate quality.

It may be proper here to observe, that two kinds of trees are known in New Zealand, which, from the circumstances of their growing to an immense height without a branch, are considered fit for masts of large ships; the one is called *Kaikaterre*, the other *Cowry*, *Kawrie*, or *Cowdy*. The *Kaikaterre* (*Dacrydium Taxifolium*), is found in low swampy ground, frequently on the banks of rivers, and is on that account easy to procure; it produces a leaf like the *yew*, and a red berry. The *cowry*, to which the inhabitants of the island give a decided preference, grows on dry ground, and often on the tops of the highest hills; its leaf, though considerably larger, is not unlike that of our *box tree*; it produces a cone, and yields abundance of resin. Some of the *cowry trees* rise one hundred feet from the ground, without a single branch, and afterwards headed almost as umbrageously as the *lime*; the stems of others not so tall, give a circumference of forty feet. The *cowry* was the timber which the Dromedary was directed, if possible, to bring home, and as it is requisite that every spar fit to make a top-mast for the larger ships of the navy should be from seventy-four to eighty-four feet long, from twenty-one to twenty-three inches in diameter, and perfectly straight, the success of the attempt, in a great measure, depended upon the proximity of the trees to the water's edge, and also in no small degree upon the friendly disposition of the natives. The ground is generally under cultivation, producing potatoes, degenerated turnips, and cabbages, while the surrounding hills, which, from their height and diversity of shape, form a splendid piece of scenery, are covered with wood; and the *cowry*, whose loftiness and richness of foliage, distinguishes it from the other trees in the forest, grows in great abundance.

AGATHOSMA (from *αγαθος* good, and *σμερ* smell).

Class 5, 1. Pentandria Monogynia.
Nat. Ord. *Diosmeæ*.

The characters are—*Calyx five-parted; petals ten, unequal, inserted in the calyx; nectary five-lobed, inserted in the calyx.*

1. AGATHOSMA HISPIDUM (rough-leaved agathosma). *Leaves three-cornered, blunt, spreading, villous, hispid; umbels terminal.*—An ornamental greenhouse plant, with white flowers, which it produces plentifully in the months of July and August. It is a native of the Cape of Good Hope. May be increased by cuttings. Introduced in 1786.

2. AGATHOSMA VILLOSUM (shaggy agathosma). *Leaves aggregate, linear, lanceolate, glandular, imbricated, channeled, villous; heads of branches terminal.*—A proliferously branched heath-like shrub, with numerous, small, rose-purple flowers. It is one of the prettiest and liveliest flowered of the genus, and continues in bloom most part of the spring and summer. The present species has been very generally mistaken for *Agathosma rubrum* by our gardeners and nursery-men, so much so that we have never met with it in any of our collections under its real name. A native of the Cape of Good Hope. Introduced in 1780.

3. AGATHOSMA TETRAGONUM (square-branched agathosma). *Leaves ovate, imbricated four ways, ciliated; flowers solitary, terminal.*—A small plant, with white flowers. A native of the Cape of Good Hope. It is readily increased by cuttings. Introduced in 1789.

4. AGATHOSMA CILIATUM (ciliated agathosma). *Leaves ciliated, carinated, lanceolate.*—A branching heath-like shrub, with small white upright flowers, which it produces very early in the spring. Requires the treatment of the Cape *heaths*, and is easily propagated by cuttings. Introduced by Mr. Masson, in 1774, from the Cape of Good Hope.]

5. AGATHOSMA RUBRUM (red agathosma). *Leaves three-cornered, smooth below, dotted in two rows, mucronate; segments of calyx smooth.*—This sort seldom rises above three feet in height, and spreads out into many branches; the leaves are smooth, and resemble those of the *heath*, and this plant from thence had the name of *Erica Æthiopica*, &c., given it by Plunket; the flowers are produced in clusters at the ends of the branches. It is a hardy greenhouse shrub. A native of the

Cape of Good Hope. Introduced in 1752.

6. *AGATHOSMA IMBRICATUM* (imbricated agathosma). *Leaves aggregate, imbricated, fringed, dotted, ovate, acuminate; heads of branches terminal, umbelled.*—A shrub two to three feet in height, with pale purple flowers. A native of the Cape of Good Hope. Introduced in 1774.

7. *AGATHOSMA PULCHELLUM* (blunt-leaved agathosma). Bot. Mag. t. 1357. *Leaves ovate, obtuse, glandular, crenate, smooth; flowers axillary, in pairs.*—This species is a very beautiful little shrub, three feet in height, producing its lively flowers in great profusion throughout most part of the summer. A native of the Cape of Good Hope. Increased by cuttings, which require to be protected from frost. Introduced into the Kew Gardens in 1787.

8. *AGATHOSMA ACUMINATUM* (acuminate agathosma). *Leaves alternate, aggregate, acuminate, subcordate, dotted, pubescent; flowers in terminal umbelled branches.*—A shrub one to two feet in height, with white or pale blue flowers, which are produced from April to July. A native of the Cape of Good Hope. Introduced in 1812.

9. *AGATHOSMA OVATUM* (oval-leaved agathosma). Bot. Mag. t. 1616. *Leaves opposite, ovate, entire, smooth, revolute at edge, beneath rusty with dots.*—This species of agathosma has considerable affinity with *agathosma pulchellum*, but its leaves are opposite, quite entire at the margin, are more obtuse, and, especially when dry, are rolled back at the sides, which makes them appear much narrower than they really are; the flowers are more scattered and not collected towards the extremities of the branches; petals white, but being tipped with red on the outside, the plant therefore looks the prettiest when many of the flowers are yet unexpanded. The leaves of both are particularly strong scented, and are (with perhaps several other species of *agathosma*), indiscriminately used by the Hottentots, under the name of *Bucku*, mixed with grease to perfume their bodies with. A native of the Cape of Good Hope. Introduced in 1790. Requires the shelter of a greenhouse, and the same treatment as other Cape evergreen plants.

10. *AGATHOSMA VIRGATUM* (twiggy agathosma). *Leaves erect, very nar-*

row, blunt.—This species is two feet in height with many branches; the flowers are white, which it produces very plentifully from March to July. A native of the Cape of Good Hope. Introduced in 1820.

11. *AGATHOSMA BIFURCA* (two furrow-leaved agathosma). *Leaves linear, erect, with two furrows beneath, apex recurved.* A shrub with white flowers. A native of the Cape of Good Hope.

12. *AGATHOSMA CEREFOLIUM* (chervil-scented agathosma). *Leaves imbricate, spreading, lanceolate, ciliate; heads terminal, five stamens sterile.*—A shrub, two feet high, the leaves, when bruised, smell like chervil. The flowers are small and white, and are produced freely from April to August. It is a native of the Cape of Good Hope. Introduced in 1790.

13. *AGATHOSMA ERECTA* (erect agathosma). *Leaves imbricated, dotted beneath, blunt.*—A very pretty shrub, two feet high, with pale violet-coloured flowers. It is a native of the Cape. Introduced in 1820.

14. *AGATHOSMA PUBESCENS* (downy agathosma). *Leaves aggregate, obtuse, oval, ciliated, spreading glandular; heads of branches terminal.*—Is about two feet high, the flowers are white. It is a native of the Cape of Good Hope. Introduced in 1807.

15. *AGATHOSMA BRUNIADES* (brunia-like agathosma). *Leaves scattered, awl-shaped, dotted.*—A shrub two feet high with lilac flowers. A native of the Cape of Good Hope. Introduced in 1820.

16. *AGATHOSMA LINIFOLIA* (flax-leaved agathosma). *Leaves acute, linear, full of dots, fringed.*—Two feet high, with white flowers. A native of the Cape of Good Hope, whence it was introduced in 1823.

17. *AGATHOSMA SQUAMMOSA* (scaly-leaved agathosma). *Leaves blunt, minutely fringed, with scales beneath, concave.*—A native of the Cape, where it is a shrub two feet in height, with white flowers. Introduced in 1818.

18. *AGATHOSMA VENTENATIANA* (Ventenat's agathosma). *Leaves lanceolate, keeled, hairy beneath.*—This is a very pretty looking shrub, producing a number of pale purple flowers at the commencement of spring. It is easily propagated by cuttings and was introduced in 1794.

19. *AGATHOSMA CRENATUM* (crenated agathosma). *Leaves ovate, crenate, dotted beneath; flowers axillary, solitary.*—A very ornamental species, producing its white flowers from January to March. A native of the Cape of Good Hope; where, according to Thunberg, it is one of the species used by the Hottentots to mix amongst their ointments, and which he observes, gives them so disagreeable, so fetid, and at the same time so rank an odour, that sometimes he could not bear the smell of the Hottentots that drove his wagon. They first dry the plant in the shade, and afterwards over the fire, before it is pulverized. Introduced in 1774.

20. *AGATHOSMA ORTUSA* (blunt-leaved agathosma). *Leaves scattered, oblong-lanceolate, blunt, somewhat keeled.*—This is a beautiful little shrub. A native of the Cape. It flowers here in the spring very freely. Masson is said to have introduced it in 1774. As it is readily increased by cuttings, it is become pretty generally cultivated. The leaves have a smell which to some persons is not pleasant. It requires the common green-house protection, and is by no means tender or delicate in its constitution. The soil should be a mixture of peat and loam in equal proportions.

21. *AGATHOSMA ORBICULARIS* (orbicular-leaved agathosma). *Leaves orbicular; branches villous.*—A native of the Cape of Good Hope, with white flowers; the stamens are twice the length of the corolla. Introduced, 1790.]

All these plants are propagated by cuttings, which may be planted during any of the summer months, in pots filled with light fresh earth, and plunged into a very moderate hot-bed, where they should be shaded in the day time from the sun, and frequently refreshed with water. In about two months the cuttings will have taken root, when they should be each transplanted into a small pot, and placed in a shady situation until the plants have taken fresh root, when they may be placed among other exotic plants, in a sheltered situation: these plants may remain abroad until the beginning of October or later, if the season continues favourable, for they only require to be sheltered from frost; so that in a dry airy green-house they may be pre-

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served very well in winter, and in summer they may be exposed to the open air with other green-house plants.

AGAVE (from *'Αγανος*, admirable, glorious, which this genus may well be said to be from its size, its appearance, and the beauty of the flowers). In mythology, *Agave* is the name of one of the Nereids.

Class 6, 1. Hexandria Monogynia. Nat. Ord.—*Coronariæ. Bromeliaceæ.* Juss.

The characters are—*The flower has no calyx, is funnel-shaped, and of one leaf, which is cut at the brim into six equal segments; the oblong germen is situated below the flower, upon which rests the slender style, which is extended a considerable length beyond the petals, and is crowned by a three-cornered stigma; this is attended by six erect stamens, of the same length, crowned by narrow summits; after the flower is past, the germen becomes an oblong three-cornered seed-vessel, having three cells, which are filled with flat seeds.* Linnaeus has separated the plants of this genus from the *aloe*, to which they had been joined by former botanists, because the stamens and style in these flowers are extended much longer than the corolla, and the corolla rest upon the germen, which in the *aloe* are not so. We may also mention another difference in the growth of the plants, by which they may be distinguished before they flower; which is, all the plants of this genus have their centre leaves closely folding over each other, and embracing the flower stem which is formed in the centre; so that these never flower until all the leaves are expanded, to give the stem its liberty to advance, and when the flower is past, the plants die. Whereas, the flower stem of the *aloe*, is produced on one side of the heart or centre of the plant, so they flower annually, and the leaves are always more expanded than those of this genus.

[The true *aloes* belong to another natural order; the *Asphodelaceæ*, which are named after *asphodel*, or *king's spear*, of which there are several varieties, natives of the south of Europe. That family all contain active principles, some of which are merely pungent, as in the onion tribe; others mild, by being blanched underground, as in common *asparagus*; and others again, are strongly

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medicinal and used as drugs, as the *aloes* of Zocotora and Barbadoes. Some of that family grow to be very large trees, as, for instance, the *dragon-tree* (*Dracæna Draco*), from which the gum-dragon of the druggists' shops is procured. One specimen of that, in the Canary Isles, is mentioned as being about seventy-two feet high, and fourteen feet in diameter at the base. Its history, as a large tree, extends back more than two hundred and fifty years.

The *agave* belongs to the *pine-apple* tribe (*Bromeliaceæ*), which contains no such giants as that which has been mentioned, and none of their pungent qualities. The whole are natives of America, though many of them have been transplanted to other parts of the world.]

1. AGAVE AMERICANA (common American agave). Bot. Rep. 438. *Stemless; leaves toothed, spiny, scape branched; tube of corolla contracted in the middle; stamina longer than the corolla.*—The common American agave (or great American aloë, as it is commonly called), has been long preserved in the English gardens, where, for many years past, there have been several of the plants in flower. When they are vigorous, the stems generally rise upwards of twenty feet high, and branch out on every side, so as to form a kind of pyramid, composed of greenish yellow flowers, which stand erect, and come out in thick clusters at every joint. The seeds do not come to maturity in England. When these plants flower, they make a fine appearance, and continue a long time in beauty, if they are protected from the cold in autumn; for there will be a succession of new flowers produced, near three months in favourable seasons. It has been generally believed, that this plant does not flower till it is an hundred years old; but this is a great mistake, for the time of its flowering depends on its growth; so that in hot countries, where it grows fast, and expands many leaves every season, it will flower in a few years; but in colder climates, where the growth is slow, it will be much longer before it shoots up a stem. [The *agave* bears some resemblance to the *pine-apple* in its leaves, only they are thicker, stiffer, and less numerous; but it produces no edible fruit. The outside leaves stand

round in a star, or crown; and the middle consists of a thick spire of leaves, so firmly twisted together, that the edges of the one impress the others with a seal. The points are armed with very strong spines; so that the plant is truly formidable, and answers well for hedges, only it occupies considerable breadth. With us it is cultivated only as an ornamental plant, and is generally set in large pots or tubs, though it bears the open air in the milder districts, all the year round. Indeed, it is apt to suffer more from the constant soaking of the rain, which gets into the central spire and rots the plant.

The scape, or flowering stem, rises from the centre of the tuft of leaves; it is smooth and green, and the branches that bear the individual clusters of flowers come off very gracefully in double curves, which have the bend downward near the stalk, and upward near the flowers. The appearance is not unlike that of a majestic candlestick, with successive branches, for a great portion of its height; and tall as the stem is, the form of the leaves give it the appearance of great stability.

Cortusus is said to have been the first European who possessed the great American aloë, and that was in the year 1561. Gerard, in his *Herbal* of 1597, speaks of it merely from report. Parkinson (*Theatr.* p. 150, printed in 1640), gives an account of its flowering at Avignon and Rome, but is silent as to its being in the English gardens. It flowered at Paris in 1663 and 1664. Mr. Verspitt, of Lambeth, had one fifteen feet high, and in flower (about 1698), which was then a great rarity here. Two other plants flowered about 1714 at Hampton Court. Mr. Cowell, however, asserts, that the plant which flowered in his garden, at Hoxton, in 1729, was the first which had been seen in England: those which are mentioned above, not being the true great American aloë. Another flowered in 1737, at Eaton Hall, in Cheshire, the seat of Sir Robert Grosvenor, Bart., and there is a plate of it, dedicated to Sir Robert, by his gardener, John Fosse. By the inscription on the print (one of which is preserved in the British Museum), it appears, that it opened the crown for flowering on June 5; the stem-bud appeared the 15th, and grew five inches a-day for some weeks. The flower-

branches were perfected in twelve weeks, and then it was at a stand for a month, whilst the flower-buds were forming. The number of flowers was about 1050. Two *agaves* flowered at Hampton Court, in 1743; they were about fifty years old, and their heights were twenty-seven and twenty-four feet. The flower-stem appeared on the third of June, was in perfection the middle of August, and continued blooming to the middle of October. A plant which flowered near Carlsbad, in 1754, was twenty-six feet high, and produced twenty-eight branches, which bore above three thousand flowers. Another flowered in 1760, in the royal garden at Fredericksberg, in Denmark, which was twenty-two feet high; it had nineteen branches and more than four thousand flowers. Two plants blossomed at Smith's nursery, Dalston, near Hackney, in September, 1790. In 1826, a fine specimen of this plant flowered in the green-house of the Honourable Newton Fellowes, at Eggeford, attaining the height of thirty feet; the stem was seventeen inches in circumference at the base, and its appearance was that of a chandelier, thirty-eight branches springing from the main stem, on which was counted five thousand flowers and flower buds; one branch alone had two hundred and sixty-one buds. A specimen of the American *aloe* in flower, was exhibited a short time ago at the Colosseum, in Regent's Park, London. It was about twenty-five feet in height; and the panicle, or bunch of flowers, which, according to the habits of the tribe, fade off at bottom as others come into flower at top, was, at some times, upwards of twelve feet.—Tropical America is the native habitat of the plant; but it grows wild, or is acclimated in Sicily, the south of Spain and Italy, and is much used in the latter country, planted in vases, as an ornament to piers, parapets, and about houses. About Milan and other towns in Lombardy, where it will not endure the winter, they use imitations of copper so well formed and painted, as to be readily mistaken for the original. In France and Germany it is very common, and in this country it formerly used to be the regular companion of the orange, myrtle, and pomegranate, then our principal greenhouse plants. The Ameri-

can *agave* is planted in Catalonia, along the road sides as hedges, and flowers at the ninth or tenth years. In France (at Perpignan), it flowers very seldom. When the scapes are young, or about twelve or fifteen feet high, and the pedicles not yet developed, they present the appearance of gigantic shoots of *asparagus*. When full grown they attain the height of twenty-five, thirty, or forty feet, and this in the course of eight or ten days. The flowering of this plant used to be considered a very rare occurrence, but the specimens being now more numerous in this country, its interest as a marvel has, consequently, fallen off; but the uses of the plant still continue.

There hardly exists a race of savages upon the face of the earth who cannot prepare some kind of beverage from the vegetable kingdom. The miserable hordes who wander in the forests of Guayana, make an agreeable emulsion from the different *palm-tree* fruits. The inhabitants of Easter Island, exiled on a mass of arid rocks, without springs, besides the sea water, drink the juice of the *sugar cane*. The natives of India, lay the *palm-trees* under contribution for their *arrack*; and the *hemp*, for that still more intoxicating and pernicious liquid, which they call *bang*. The most part of civilized nations draw their drinks from the same plants which constitute the basis of their nourishment; and the old continent affords us no instance of vine plantations but to the west of the Indus. But in the new continent we have the example of a people, who not only extract liquors from the amylaceous and sugary substance of the *maize*, the *manioc*, and *bananas*, or from the pulp of several species of *mimosa*, but who cultivate expressly a plant of the family of the *ananas*, to convert its juice into a spirituous liquor, which is called *pulque*. On the interior table land, and in the intendency of Puebla, and in that of Mexico, through a vast extent of country, the eye reposes only on fields planted with *pittes* or *maguay*. This plant, of a coriaceous and prickly leaf, which, with the *cactus opuntia*, has become wild since the sixteenth century throughout all the south of Europe, the Canary Islands, and the Coast of Africa, gives a peculiar character to the Mexican landscape. What a contrast of ve-

getable forms between a field of grain, a plantation of *agave*, and a group of *bananas*, of which the glossy leaves are constantly of a tender and delicate green! Under every zone, man, by multiplying certain vegetable productions, modifies at will the aspect of the country under cultivation.

The *agaves* are planted in rows, at a distance of fifty-eight inches from each other. The plants only begin to yield the juice, which goes by the name of *honey*, on account of the sugary principle with which it abounds, when the *hampe* is on the point of its development. And as the plant is destroyed, if the incision be made long before the flowers would naturally have developed themselves, it is of great importance for the cultivator to know exactly the period of efflorescence. Its proximity is announced by appearances which the experienced cultivator readily understands. He goes daily through his *agave* plantations to mark the plants that approach efflorescence; and if he has any doubt, he applies to the *experts* of the village—old Indians, who, from longer experience, have a judgment or rather tact more securely to be relied on.

About the age of eight years in general, but in good soils so early as five, and in bad not till eighteen, a *maguery* begins to give signs of the development of its *hampe*. They then prepare to collect the juice of which the *pulque* is made. They cut the *corazon* or bundle of central leaves, and enlarge, insensibly, the wound, covering it with lateral leaves, which they raise by drawing them close and tying them at the extremities. In this wound the vessels appear to deposit all the juice which would have formed the colossal *hampe* loaded with flowers. This is a true vegetable spring that keeps running for two or three months, and from which the Indian draws three or four times a-day. We may judge of the quickness or slowness of the motion of the juice, by the quantity of *honey* extracted from the *maguery* at different times of the day: a plant commonly yields, in twenty-four hours, two hundred and forty-two cubic inches, nearly equal to eight pints, of which three are obtained at sun-rise, two at mid-day, and three at six in the evening. A very vigorous plant sometimes yields about seven quarts, or four hundred and fifty-four

cubic inches per day, for from four to five months, which amounts to the enormous quantity of sixty-seven thousand one hundred and thirty cubic inches, supplied by a plant scarcely five feet in height.

This abundance of juice, produced by a *maguery* of this size, is so much the more astonishing, as the *agave* plantations are in the most arid grounds, and frequently on banks of rocks, hardly covered with vegetable earth. The *honey*, or juice of the *agave*, is of a very agreeable sour taste. It easily ferments, on account of the sugar and mucilage which it contains. To accelerate this fermentation, they add, however, a little old and acid *pulque*. The operation is terminated in three or four days. The vinous beverage, which resembles cider, has an odour of putrid meat, extremely disagreeable; but Europeans who have been able to get over the aversion which this fetid odour inspires, prefer the *pulque* to any other liquor. They consider it as stomachic, strengthening, and especially as very nutritive; and it is recommended to lean persons.

A very intoxicating brandy is formed from the *pulque*, which is called *mexical* or *aguardiente de maguery*. The Spanish colonial government prohibited its use, as prejudicial to the Spanish brandy trade, but such quantities of it were manufactured, that the whole importation of brandy into Mexico alone, amounted to thirty-two thousand barrels. The inconsiderate indulge in the use of the intoxicating spirit, to the same excess as they do in spirits from *grain*, *potatoes*, *bet-root*, and other vegetables in Europe. The people of all countries are too fond of using such pernicious beverages.

But the *maguery* is not only the wine of the Aztecs, it can also supply the place of the *hemp* of Asia, and the *papyrus* of the Egyptians. The paper on which the ancient Mexicans painted their hieroglyphical figures was made of the fibres of *agave* leaves, macerated in water, and disposed in layers like the Egyptian *papyrus*, and the *mulberry* of the South Sea Islands. M. Humboldt brought home with him several fragments of Aztec manuscripts written on *maguery* papers, of a thickness so different, that some of them resembled pasteboard, while others resembled Chinese paper. These fragments are so

much the more interesting, as the only hieroglyphics which exist at Vienna, Rome, and Veletri, are on Mexican stag skins. The leaves of *agave* are very useful as a succedaneum for soap. For this purpose, after being cut, they are passed between the rollers of a mill with their point foremost; and the juice being conducted into wide, shallow receivers, through a coarse cloth or strainer, it is exposed to a hot sun, until the aqueous part being exhaled, it is reduced to a thick consistence. It may then be made up into balls, with the help of lye ashes. It will lather with salt water as well as fresh. This soap may also be prepared by pounding the leaves in a wooden mortar, and then expressing the juice, which may be brought to a consistence by the sun, or by boiling. One gallon of juice thus prepared, will yield about one pound of a soft extract. The juice, in both these ways, must be carefully strained; and the extract must never be combined with tallow or other unctuous materials. The leaves are also used for scouring pewter, and other kitchen utensils, and floors. The inward spongy substance of the decayed stalk is used for tinder. The fibres of the leaves, separated by bruising and steeping in water and afterwards beating them, make a strong thread for common uses. The thread which is thus obtained from the *maguay* is known in Europe by the name of *pite thread*, and is preferred by naturalists to every other, because it is less subject to twist. The juice which the *agave* yields, when it is still far from the period of efflorescence, is very acrid, and is successfully employed as a caustic in the cleansing of wounds. The prickles which terminate the leaves served formerly, like those of the *cactus*, for pins and nails to the Indians. The root, prepared with sugar, is made into sweetmeats. The leaves of the plant form the roofs of some of the Indian houses—the stalks their props and rafters. The flower-buds are eaten, boiled or pickled. The plant attains a great size; some of the leaves measure ten feet long, fifteen inches wide, and eight thick. From what we have related respecting the use of the different parts of the *maguay*, it would appear, that next to the *maize* and *potato*, this plant is the most useful of all the productions with which na-

ture has supplied the mountaineers of equinoxial America.

Varieties of the common American *agave*, with gold and silver striped leaves, are now pretty common in the English gardens.

Very few of the variety with yellow-edged leaves have yet blossomed. We have an account of one at Sir James Lake's, in Edmonton, which was eighty years old, and the height of the flowering stem was twenty-one feet. The top bud of the stem appeared on the 6th of June, 1785; it was in full bloom on the 12th of September, and out of bloom on the 19th. In the Botanic Garden at Cambridge, there is a very large variegated *agave*, which came out of the Sherardian collection, at Eltham, and belonged to Dr. Walker, the founder of the Garden. It must, therefore, be more than sixty years old, and has not yet produced flowers.

The varieties with striped leaves are most handsome, but they do not flower so readily. Indeed, none of them can be made to flower in this country without artificial heat.]

2. AGAVE VIVIPARA (viviparous or childing *agave*). *Stemless; leaves toothed*.—This never grows to a large size; it is so tender that it will not thrive out of the stove even in summer; and as it never produces off-sets or suckers from the roots, it cannot be propagated that way except when in flower, when there will be an abundance of them. They require a light sandy earth, and should have little wet in winter, but may be gently watered twice a week in summer, and be allowed a great share of free air. Every summer they must be shifted, but not have large pots, and have fresh earth; unless the roots are confined, the plants will not thrive. This plant grows in St. Domingo and Jamaica, and its resinous juice forms a part of the *caballine aloes* of the shops. [Mr. Miller cultivated it in 1731.]

3. AGAVE VIRGINICA (Virginian *agave*). *Stemless, herbaceous; leaves tooth-thorny*.—The *Virginian agave* is so like the first sort, as not to be distinguished from it, but by good judges. The principal differences are, that the leaves of this are narrower toward their extremities, and of a paler colour; the stems do not rise so high, nor do they

branch in the same manner, but the flowers are collected into a close head at the top; they are however of the same shape and colour. This sort seldom puts out so many offsets as the *common aloe*, though it generally produces sufficient for propagation. They should be planted in tubs filled with light sandy earth, and housed in winter, and during that season should have little wet. They may remain abroad during summer, and until the end of October. Introduced in 1765, by Mr. John Cree.

4. *AGAVE LURIDA* (Vera Cruz agave). *A little stemmed; leaves toothed, spiny; scape branched.*—This also greatly resembles the first, but the leaves are much thinner, the indentures on their edges closer, and the spines blacker. This sort is rather tender, and may remain longer in the green-house in the spring, and be housed a little sooner.

The *rigid or narrow-leaved agave* is a variety of this species. It has long narrow, stiff leaves, that are entire and terminated by a stiff black spine. They are seldom more than two feet long, little more than an inch broad, and of a glaucous colour. The side leaves stand out almost horizontally. This sort never puts out suckers, nor have I seen any plants of it in flower, although there are many of them in the English gardens, some of which are of a considerable age. This is a very tender plant, and cannot be preserved through the winter in England, unless placed in a warm stove; nor will it thrive well if set abroad in summer, but should constantly remain in the stove, observing to let them enjoy a free share of fresh air in warm weather. [Cultivated in 1731, by Mr. Miller.]

5. *AGAVE TUBEROSA* (tuberous-rooted agave). *Caulescent; leaves tooth-thorny.*—The *tuberous-rooted agave* has the leaves indented on their edges, and each indenture terminates in a spine; the root is thick, and swells close above the surface of the ground; in other respects it agrees with the species just described. This has not flowered in England. I have raised it from seeds which were sent me from America; but the plants never put out suckers from the roots. Linnæus supposes it to be the same with the *fœtid-leaved*, but whoever sees the plant will not doubt of their being distinct. Introduced in 1739.

6. *AGAVE FÆTIDA* (fœtid-leaved agave). *Caulescent; leaves quite entire.*—The *fœtid-leaved agave* has long, narrow, stiff leaves, of a pale green colour, not indented on their edges, but frequently a little waived. It is seldom more than three feet high, but the flower-stem rises near twenty, and branches out much like that of the first, but more horizontally; the flowers are of the same shape, but smaller and of a greener colour. A plant of this species flowered in the Chelsea Garden, in the year 1755. The stem began to shoot the beginning of October, and by the end of that month, was upwards of ten feet high; by the end of November it was near twenty, and the lower lateral branches were upwards of four feet long, the others decreasing gradually so as to form a regular pyramid. In December, the branches closely set with flowers; and in the spring, when the flowers dropped off, they were succeeded by young plants.

7. *AGAVE KARATTO* (Karatto agave). *Leaves erect, bright green, with an entire brown edge.*—The leaves of the *karatto agave* are from two feet and a half to three feet long, and about three inches broad, ending in a black spine, and standing more erect than in the others. This sort hath not flowered in England. The plants were sent me from St. Christopher's, by the title of *karatto*, which I suppose is given indifferently to other species of this genus; for I have frequently heard the inhabitants of America call the *common agave* by the same name.

[All the species greatly resemble each other, and it is doubtful, whether in the works of several travellers, different species of *agave*, *aloe*, and even *bromelia*, are not confounded in their descriptions of their uses. There is, for example, a species of *bromelia* designated *karatas*. Hedges of *karatas* are frequently mentioned without noticing the generic name of the plant. Introduced in 1768.

8. *AGAVE GEMINIFLORA* (pair-flowered agave). *Leaves thready at edge; flowers of spike approximating by pairs.*—This plant has been cultivated in the English green-houses for several years past; but none of the specimens we have seen, appear yet to approach the stage of growth at which they may be expected to flower. The species is

presumed to be a native of South America, and to have found its way into Italy through Lisbon; and flowered for the first time in Europe, at Milan, in 1815, after having been cultivated in various gardens on the continent for at least twenty years past. The caudex or trunk of this plant, was, in Milanese measures, a yard high, and seven inches thick; the leaves about one yard long; the flower-stem eight yards and two inches high; the flowers, of which one thousand four hundred and eighty-two were counted, about an inch in depth.

Signor Tægliabue (superintendent of the Duke of Litta's garden, at Lainet, near Milan), states, that finding his plant, although old, showed no symptoms of producing offsets or suckers, he be-thought himself of searing the bud at the summit of the stem with a red-hot iron, and thus stopping its growth in the only direction it had yet proceeded in. The consequence of his doing so was, that the wound soon healed and a brood of suckers was produced round the caudex, which were fit for removal from the parent plant in the space of three months afterwards. We presume this was done to a plant that had not flowered, as the production of bloom in monocotyledonous plants, of the nature of the present, is generally followed by a production of suckers, and generally by the destruction of the trunk or caudex.]

Some of this *genus* require the stove, others do best in the green-house; they are easily cultivated, growing well in loamy soil, and are propagated by suckers. They should have little wet in winter, but in summer they may be gently watered twice a week. If they have too much water it rots their roots, and then their leaves will decay, and insects will infest them. They should be shifted every summer into fresh earth, but must not be put into large pots, for unless their roots are confined, the plants will not thrive.

[AGE OF TREES.—The growth, duration, and the causes which conduce to the decay of timber-trees, is a question that bears directly upon points of general interest, and of great practical importance, and is not one of mere curiosity.

Man loves to contemplate and to ponder on the wrecks of past ages, which have escaped the destructive

power of time. The smallest remains of human art, the least fragment of those fossil stones which are records of the ancient revolutions of the earth; rivet his attention, and excite his lively curiosity. An interest still more natural and more affecting, seems to belong to the living memorials of distant ages; still, life in general is so short, that living monuments will always seem as if only as yesterday, when contrasted with those that are lifeless. The longevity of certain trees is a question which has a genuine interest. If we set any value upon the records of antiquity, how much shall we be gratified to learn that such a tree is cotemporary with the most ancient generations. In certain cases, this knowledge may elucidate the history of monuments, as some monuments may help to throw light upon that of trees which have long been neighbours to them. This question may also become auxiliary to the history of the globe itself. If some researches of this kind were made in volcanic or madriporic isles, it is probable we might discover some data of their origin. If we reflect upon the means of attaining the solution of the question, we perceive they are all founded upon a very exact appreciation of the habitual laws of the growth of trees, and this knowledge may be directed to clear up many parts of vegetable physiology.

It is chiefly to annual and biennial plants that what may be called a precise period of duration is fixed; a period determined by the production of their fruit, and not capable of being prolonged beyond that event, except by artificial means. But a very large proportion appears to be capable of an almost indefinite period of existence, if it were not for accidents and disease, independent of old age. This proportion of the vegetable kingdom, whether herbaceous, shrubby, or arborescent, may be classed under two principal modes of growth.

1. EXOGENOUS or DICOTYLEDONS.

2. ENDOGENOUS or MONOCOTYLEDONS.

The *first*, which is by far the most numerous, increase from the beginning, simultaneously in length and diameter, but principally in length, by the annual insinuation of longitudinal fibres into a space beneath the bark, and on the outside of the wood near the circum-

ference. The way in which their age is computed is two-fold; first, by comparing them with other old specimens, the rate of growth of which is known; and secondly, by cutting out a portion of their circumference, and then by carefully examining the end formed by the saw, we shall find the surface to be composed of circles, one within another, from the bark to the centre; and by counting their number, it will give the term of its duration.

It appears that the sap-vessels, under the bark, which are in a soft spongy state during the summer, harden in the winter, and become firm wood. In the next spring, fresh sap rises in another circle of vessels, pushing the bark outwards, and, in its turn, changes into the close-grained proper wood of the tree. Thus the whole is enlarged, and these annular and annual additions are in general clearly discernible. In looking at the end of a piece of timber, or the arm of a tree newly cut, the parts within two or three inches round the edge look whitish, whilst that towards the middle is much darker. The whiter part is a younger and softer wood; and because the juices of the tree most abound therein, workmen call it the *sap*. The dark part is the *heart*, and is, in fact, the only part fit for use, where good timber is required. For in exogenous trees, the woody cylinder of one year is divided from the succeeding one by a denser substance, which distinctly marks the line of separation between the two years.

The first of these methods is sufficiently correct to give at least an approximation to the truth, and the latter would be absolutely correct, if one could be quite sure that observers provided against all possible causes of error. But it has been shown (in Dr. Lindley's *Introduction to Botany*, p. 66), that in consequence of the extreme inequality (as regards thickness) of the annual layers of wood on opposite sides of a stem, a person who judged of the whole age of a tree by the examination of the layers of the stunted side only, would commit errors to the amount of *sixty per cent.* and more.

The manner of growth in exogenous being such as has been described, they may be compared to a succession of hollow cylinders, of gradually increasing diameters, and sheathing one the other.

This being the case, and the last cylinder having its own independent vitality, it is apparent that under constantly favourable circumstances, trees of this kind may continue to exist until the end of time, there being no conceivable manner in which their death can be brought about, except by accident. There is, indeed, nothing physically impossible in the notion, that some individuals now existing, may even have been silent witnesses of the Noachian deluge. To the natural historian, no subject is more interesting than the still life memoirs of the vegetable world. He finds no retrospects more pleasing than those which relate to woodland scenes; no task more grateful than a contemplation of those vast "inheritors of the earth," which adorn and beautify our groves and lawns.

Amongst the many remarkable cases upon record, of the extreme old age which some trees attain, the following are some of the more interesting:—in forest annals, no tree affords so many fond, so many grand memorials as the *oak*; no object is more sublime than this stately plant; and yet, as Pontey truly says, "even our *mushrooms* are tended with a nurse's care, while the *oak*, the pride of our woods, the chief material of our navy, and consequently the bulwark of our country, is (too often) left to thrive or rot by chance unheeded, if not forgotten." So great, indeed, has been this apathy, so extraordinary the perverseness which has prevailed on this subject, that the destruction of our forests has actually been regarded as a matter for exultation. In one of the returns from Suffolk, to the Commissioners of Land Revenue, it is stated, that "timber is decreased in the woods and hedgerows, as it ought to be," and in some of our agricultural reports, *oak* is disparagingly mentioned as the mere weed of the country. Happy is it for those who love to roam in woodland scenery, that "on thousands of acres" the *oak* has been looked upon as the mere *weed* of the country; for it is owing principally to this that many fragments of our ancient woods have been suffered to escape the ravages of *improvement*.

The reckless system of extermination, which has been pursued from age to age, has, indeed, so grievously thinned our forest lands, that of many cele-

brated woods, scarcely anything but the name survives. And yet, notwithstanding all this rage for destruction—notwithstanding the fearful devastations which the last two centuries have witnessed, few civilized countries possess so many “chieftain wonder trees” as our own. Perhaps no landscape feature is more missed by Englishmen abroad, especially when travelling through France, than those noble monuments of past time, which have given beauty to the land, and shelter to its inhabitants for so many generations. This may probably be owing to the prejudice against the use of coal as fuel, which prevails so extensively abroad, and which leads to the condemnation of trees for fire-wood, when their carved trunks no longer fear the axe, nor dread being converted into timber.

In the present day especially, the slightest whim of the owner fells an ancient tree, revered by his forefathers during many centuries; an instant destroys that which pitiless time had spared for ages; that which so long a lapse of time can alone replace. It is not so in the east; in those countries where shade is at the same time more wanted, and less frequent, a large tree becomes to the inhabitants, especially if it grows near their dwellings, a precious object; and is equally respected with the far less admirable works of art with which the ancients covered their classic lands. “Even among the Turks,” says a traveller, “it is an enormous crime to cut down old trees, and all the neighbourhood would be ready to make any sacrifice to preserve the hospitable shade. I have often seen shops built beneath a great *plane tree*, which appeared to come out of the roof, and to cover them with leaves, and the walls were traversed with the branches, which the owner feared to lop.” “Old trees,” he continues, “are generally surrounded by a fence or bank, which serves to cover and defend them; and this in the common fields where they do not belong to any one in particular.” How far are we from such a conservative spirit!!!

Amongst ancient trees, there are few, so worthy of attention as an *oak* which may be seen in the Pays de Caux, about a league from Yvetot, in the burial ground of Allonville, and close to the

church. This *oak* has sessile leaves and acorns, on footstalks, and is therefore of the true naval species. Above the roots it measures upwards of thirty-five English feet round, and at the height of a man, twenty-six feet. A little higher up it extends to a greater size, and at eight feet from the ground, enormous branches spring from the sides and spread outwards, so that they cover with their shade a vast extent. The height of the tree does not answer to its girth: the trunk, from the roots to the summit, forms a complete cone; and the inside of this cone is hollow throughout the whole of its height. Several openings, the largest of which is below, affords access to this cavity. All the central parts having been long since destroyed, it is only by the outer layers of the *alburnum*, and by the bark, that this venerable tree is supported, yet it is full of vigour, adorned with abundance of leaves, and laden with acorns.

Such is the oak of Allonville, considered in its state of nature. The hand of man, however, has endeavoured to impress upon it a character still more interesting, by adding a religious feeling to the respect which its age naturally inspires.

The lower parts of its hollow trunk has been transformed into a chapel, of six or seven feet in diameter, carefully wainscoted and paved, and an open iron-gate guards the humble sanctuary. Above, and close to the chapel, is a small chamber, containing a bed; and leading to it there is a staircase, which turns round the body of the tree. At certain seasons of the year divine service is performed in this chapel.

The summit has been broken off many years, but there is a surface at the top of the trunk, of the diameter of a large tree, and from it rises a pointed roof, covered with slates, in the form of a steeple, which is surmounted with an iron cross, that raises itself in a truly picturesque manner, from the middle of the leaves, like an antique hermitage, above the surrounding wood. The cracks which occur in various parts of the tree, are, like the fracture whence the steeple springs, closely covered with slates, which, by replacing the bark, doubtless contributes to its preservation. Over the entrance to the chapel an inscription appears, which

informs us that it was erected by the Abbe du Detroit, curate of Allonville, in the year 1696; and over the door of the upper room is another, dedicating it, "To our Lady of Peace." One cannot give to the oak of Allonville less than nine hundred or one thousand summers. Perhaps, in its youth, it lent its shade to the companions of William the Conqueror, when they assembled to invade the British shore. Perhaps the Norman troubadour, on the return of the first crusade, there often sang to his admiring fellow-countrymen, the exploits of Godfrey and of Raymond.

At the deplorable period when every thing belonging to religion was condemned, the revolutionists, having come to Allonville to burn the oak, were vigorously opposed by the country people, and the sanctuary was preserved.

In England, there are many oaks larger and loftier than this of Allonville, but few that are so interesting. At Eilerslie, the birth place of Wallace, three miles to the south-west of Paisley, stands an oak, in the branches of which, tradition relates that celebrated chieftain to have concealed himself, with three hundred of his followers. However improbable, the latter circumstance may be, it is certain that the tree might have been a remarkable object even at that period; and if so, it must be at least seven hundred years old. Its branches are said to have once covered a Scotchacre of ground; but its historical interest has rendered it a prey to the curiosity of the stranger, and its limbs have gradually disappeared, and little now remains except its trunk.

OWEN GLENDOWER's oak is situated at Shelton, distant about a mile from Shrewsbury. It has its name from a tradition of Owen Glendower having mounted this tree to gain a view of the battle of Shrewsbury, which was fought on the 20th of July, 1403, between the forces of Henry the Fourth, and those of Hotspur Percy. There is no difficulty in believing, from the present appearance of the tree, that it is old enough to have been of a considerable size at that time (four hundred and thirty years ago). It is still alive, and bears hundreds of acorns every year, though it has the appearance of great age, and is so hollow in the inside, that it seems to stand on little more than a

circle of bark. At least six or eight persons might stand within it. The dimensions are as follow:—The girt at bottom, close to the ground, is forty-four feet three inches; at five feet from the ground, twenty-five feet one inch; and at eight feet from the ground, twenty-seven feet four inches. Height of the tree, forty-one feet six inches.

Major Rooke observes, it was perhaps the inland situation of the little forest of Salcey, ten miles from Northampton, that caused some of its majestic oaks to escape the axe, until age had secured them from the claims of the dock-yard; and of these the great *Salcey Oak* is the most remarkable. Its circumference at bottom, where there are no projecting spurs, is forty-six feet ten inches.

At one yard from the ground thirty-nine feet ten inches; at two yards, thirty-five feet nine inches; at three yards, thirty-five feet.

Its circumference, within the hollow of the trunk near the ground, is twenty-nine feet; at one yard from the bottom, twenty-four feet seven inches; at two yards, eighteen feet six inches; at three yards, sixteen feet two inches.

The major figures this living cavern, with an arched entrance on either side, closed with gates, thus forming an inclosure, in which cattle might be penned; and adds, "From observations that have been made by naturalists on the longevity of the *oak*, there is reason to suppose that this tree is at least one thousand five hundred years old.

This outstrips the poet Dryden's praise, who estimates its continuance at nine hundred years, when he sings,

"The monarch oak, the patriarch of trees,
Shoots rising up, and spreads by slow degrees,
Three centuries he grows, and three he stays,
Supreme in state, and in three more decays."

Other oaks of this kind, though less remarkable for their size, are common in many parts of the country, and known as "*bull oaks*," from the circumstance of these animals taking shelter within them, which, when they are of smaller dimensions, they "effect not by going in and turning round, but by retreating backwards into the cavity, till the head alone projects at the aperture."

Mr. South describes one standing in the middle of a pasture, and bearing

the most venerable marks of antiquity, which gives a name compounded of itself and its situation to the farm on which it grows, viz. *Oak-ley* farm; the hollow of this tree was long the favourite retreat of a particular bull. Twenty people (old and young) have crowded into it at the same time. A calf being shut up there on one occasion, its dam, a two-year old heifer, constantly went in to suckle it, and still left sufficient room within for milking her. "It is supposed," he adds, "to be nearly a thousand years old; the body is a mere shell covered with burly protuberances; the upper part of the shaft is hollow like a chimney. It has been mutilated of all its limbs; but from their stumps arise a number of small branches, forming a bushy head, so remarkable for fertility, that in years of plenty, it has produced two sacks of acorns in a season. It measures in the middle, round the burls, twenty-nine feet three inches, little more than half the size of the noble *Salcey patriarch*. Circumference round the stumps of the old arms, thirty-one feet six inches, and in the smallest part (between two and three feet from the ground), its girth is twenty-six feet.

In the Bath Society's papers, we have the dimensions of another very grand *bull oak*, in Wedgenock Park, Warwickshire, which measures at three feet from the ground, eleven yards one foot in circumference; at one foot from the ground, thirteen yards one foot; at six feet from the ground, twelve yards one foot. Its broadest side seven yards five inches, close to the ground eighteen yards, one foot, seven inches. Height of the trunk only about four yards one foot. The inside quite decayed, and when the writer saw it, a cow and a sheep had sheltered themselves within it. The head was very round and flourishing.

Martyn mentions *Fisher's oak*, about seventeen miles from London, as a tree of enormous bulk, the trunk alone remaining about four fathoms in compass. When King James made a progress that way, a schoolmaster of the neighbourhood and all his scholars, dressed in oaken garlands, came out of this tree in great numbers, and entertained the king with an oration.

The *Nannau oak* had been for ages an object of superstitious dread to the peasantry of Merionethshire. On the

13th of July, 1813, it fell suddenly to the ground. A drawing had fortunately been made by Sir R. C. Hoare, only a few hours before it fell, which has perpetuated its resemblance, and will long preserve the recollection connected with its history. It represents it as it then stood, pierced and hollowed by time, and blasted by strokes of lightning; and with its blanched and withered branches forming a contrast to the freshness and beauty of the surrounding scene.

In the neighbourhood it was known as the *haunted oak*, the *spirit's blasted tree*, or, in Welsh, "*Ceubren yr Elyll*," the hobgoblin's hollow tree. For these fearful names it is indebted to a circumstance well known in the history of that country. Howel Sele, a Welsh chieftain, and lord of Nannau, was privately slain during a hunting quarrel, by his cousin, Owen Glyndwr, or Glendower, and hidden for a long time within its hollow trunk. The remembrance of this tragical event was afterwards preserved by tradition among the peasants, who would point out to the traveller the "*haunted oak*;" and as they passed it in the gloom of night, would quicken their pace, and perhaps murmur a prayer for personal protection, against the craft and assaults of the demon of the tree. It was twenty-eight feet in circumference.

Many other instances are recorded of the great age to which the oak attains.

Besides which, the famous *chestnut* trees of Mount Etna, called the *castagnade cento cavalli*, one hundred and eighty feet in circumference at the bottom of the trunk, are undoubtedly of very great antiquity.

In the garden of Olives, at Jerusalem, there are eight *olive* trees, which can be proved by historical documents to have been there previously to the conquest of that city by the Turks, and consequently they must be at least eight hundred years old.

Of the *yew* tree, many authentic instances can be adduced. There is one especially in the neighbourhood of Staines (at Ankerwyke House), that was there previously to the meeting between King John and the Barons, who compelled him to sign Magna Charta, A. D. 1215. Whilst those at Fountain's Abbey, in Yorkshire, are probably more than one thousand two

hundred years old, and some are said to be two thousand five hundred and three thousand years old.

The *baobab* trees of Africa, and the deciduous *cypress* of Chapultepec in Mexico, make pretensions to still higher antiquity, the first having been estimated by Adanson at five thousand one hundred and fifty years, and the other, the younger, De Candolle considers still older.

In the course of the inquiry into the method of computing the age of ancient trees, a discovery has been made of some importance to timber growers, inasmuch as it shows that those, who

plant for profit alone, should not allow their trees to grow beyond a certain number of years, varying according to species: for it has been found, that so far are exogenous trees from continuing always to increase in diameter at the same rate, that every kind diminishes in its rate of growth after a certain age;—the *oak*, for example, between its fortieth and its sixtieth year, the *elm* after its fiftieth, the *spruce-fir* after its fortieth, and the *yew*, probably, after its sixtieth. With reference to this subject, Professor De Candolle has constructed a table of rate of growth, which we subjoin.

Table of the rate of Increase in Diameter of certain Exogenous Trees expressed in lines.

		Quercus pedunculata, 130 years old.	Quercus sessiliflora, 210 years old.	Quercus sessiliflora, 333 years old.	Larchfir, 255 years old.	Elm, 335 years old.	Spruce Fir, 120 years old.	Yew, 71 years old.
Yrs.	Yrs.							
1	to 10	54	10	18	48	16	41	8
10	.. 20	62	16	33	61	44	54	11½
20	.. 30	54	22½	39½	58	58½	52	12
30	.. 40	60	12	38	72	72	45	10½
40	.. 50	48	13½	23	46	88	35½	7
50	.. 60	44	14	12½	57	74	36	12½
60	.. 70	56	10½	9	46	78½	18	8
70	.. 80	44	11	9½	29	66	17	
80	.. 90	32	9½	8½	30	59	13	
90	.. 100	32	9½	8	24	45	13	
100	.. 110	30	9½	7½	32	30	22	
110	.. 120	36	9	8½	26	30	22	
120	.. 130	30	9	8	20½	24		
130	.. 140		9½	10	22	24		
140	.. 150		10	8	23	18		
150	.. 160		8½	8½	21	19		
160	.. 170		9	9	20	17½		
170	.. 180		10	8	19	23		
180	.. 190		9	8	18	30		
190	.. 200		9	7	21	34		
200	.. 210		9	8	22	34		
210	.. 220			7	22½	26		
220	.. 230			6	21	36		
230	.. 240			8	22	28		
240	.. 250			8	20½	26		
250	.. 260			7½		24		
260	.. 270			8		17½		
270	.. 280			8		26		
280	.. 290			8½		28		
290	.. 300			8½		29		
300	.. 310			9		16		
310	.. 320			8		16½		
320	.. 330			8		21		

The mode of increase in the *endogenous kinds*, when young, is in diameter rather than in length, until a certain magnitude is obtained, and then to shoot up a stem, the diameter of which is never materially altered.

It is more difficult to ascertain the age of endogenous trees (which comprise principally the palm tribe, and some other tropical trees), than of the exogenous; they present an appearance of so many wooden pillars, of which the outer parts are the older and harder—the inner are younger and softer.

The diameter, which trees of this sort ultimately attain, is very nearly gained before it begins to lengthen, and, afterwards, all the new woody matter, which every successive leaf necessarily produces during its development, is insinuated into the centre; for the addition of new matter, to a trunk of this kind, is by longitudinal fibres in the inside near the centre.

This mode of growth would seem to preclude the possibility of such trees attaining to any very considerable age; for the woody matter, previously existing in the centre, being displaced, and constantly forced outward towards the circumference, and the outer rind or cylinder not accommodating itself by expansion, this part of the tree must, of necessity, become gradually harder.

But when arrived at a certain measure of firmness, it will, in consequence, give way no longer. The central parts will then gradually solidify, as new matter is still introduced by the leaves of new wood, until, at length, the whole stem becoming equally hard, and no longer capable of giving way, as soon as this occurs, the tree ceases to exist; and although it has been conjectured that certain Brazilian cocoa-nut palms are from six to seven hundred years old, yet from the method of computing their age, which is either by the number of rings externally visible upon their rind, between the base and the summit of the stem, or by comparing the oldest specimens, the age of which is unknown, with young trees of a known age, it is apparent that it is not founded upon sound physiological consideration, but is entirely conjectural. Besides which, the Arabs do not assign to the date palm, which is the sort best known to Europeans, a greater longevity from two to three centuries.

M. De Candolle observes, admitting that the outer rings of the stalk mark the years, we may reckon the proximate age of the palms of Brazil, after the elements furnished by the magnificent work of M. De Martius, as follows—

	Height of the trunk.	Diameter of the trunk.	Distance of the rings.	Probable age.
	Feet.	Inches	Inches.	Years.
<i>Cenocarpus Bataua</i>	80	12	7	1
<i>Euterpe oleracea</i>	120	8 to 9	4 to 5	300
<i>Euterpe edulis</i>	100	6 .. 7	4 .. 5	300
<i>Iriarteia exorhiza</i>	80 to 100	12	4 .. 6	250 to 300
<i>Guilielma speciosa</i>	80 .. 90	6 .. 8	4 .. 5	250 .. 300
<i>Cocos oleracea</i>	60 .. 80	12	1 .. 2	600 .. 700
<i>Cocos nucifera</i>	60 .. 80	4 .. 12	3 .. 12	80 .. 330

AGERATUM, (*Ἀγέρων*, Diosc. from a privative, and *γῆρας*, senectus, never old, evergreen).

Class 19, 1. Syngenesia Polygamia æqualis. Nat. Ord. *Compositæ*.

The characters are—*Receptacle naked; pappus with five somewhat awned paleæ; involucre oblong in a double row; corollas 4-5 fid.*

1. **AGERATUM CONYZOIDES** (hairy *ageratum*). *Leaves ovate, subcordate;*

stem hairy; paleæ of pappus, awned, tooth-letted.—It grows naturally in Africa, in the islands of America, and also in the Isle of France, in the South Seas. It is easily propagated, and well deserving of a place in every stove. It flowers during a considerable part of the summer; and even the severities of winter witness the expansion of its pretty blue blossoms. Introduced in 1714.

2. **AGERATUM LATIFOLIUM** (broad-

leaved *ageratum*). *Leaves ovate, cuneate at base; stem pilose; paleæ of pappus lanceolate acute.* This species is a native of Peru. The flowers are white, which it produces freely in July and August. Introduced in 1800.

3. *AGERATUM STRICTUM* (upright *ageratum*). *Stem erect; simple, scabrous; leaves cordate, rugose, unequally serrated.* This species, which has not much beauty to recommend it, was raised by Messrs. Whitley and Co., of the Fulham Nursery, in November, 1821, from seeds received from Dr. Wallich, and marked as coming from Nepal.

4. *AGERATUM MEXICANUM* (Mexican *ageratum*). Bot. Mag. t. 2524. *Hispid; leaves cordate, ovate, crenate, rugose; corymbs compound; paleæ of pappus lanceolate, awned.*—The stem of this species, when flowering, is erect, but throwing out, near the base, procumbent sterile branches. The flowers are produced in a terminal, irregularly branched corymb, of a delicate blue. It is a native of Mexico. Introduced in 1822. The seeds must be sown on a hot-bed in the spring, and when the plants are strong enough to remove, they should be transplanted into another moderate hot-bed, observing to water and shade them until they have taken root, after which time they must have a good share of air in warm weather. In June they should be inured to the open air, and toward the middle of the month, they may be transplanted into the full ground, where they will begin to flower in July, and continue flowering till the frosts in autumn destroy them. The seeds ripen in September and October, and when any of them fall upon the ground, if the same earth happen to be put on a hot-bed the following spring, the plants will come up in great plenty, as they frequently do in the open air; but these plants will be too late to produce good seeds, unless the summer proves warm.

[*AGRICULTURE* (from the Latin words *ager*, field, and *cultura*, or tillage, from *colere* to till).

AGRICULTURE, in the abstract, may be defined, "The art of making the earth produce the largest quantity and that in the greatest perfection, those vegetables which are necessary to the subsistence of, or useful for, the accommodation of man." It differs from

gardening (which may, in fact, be considered only as an improved branch of agriculture) in this respect. The gardener is occupied in rearing small quantities of the nicer and more delicate vegetables, which are valuable, rather as luxuries than as articles of food, whereas the agriculturist labours on a larger scale, with a view to supply himself and his countrymen with the necessaries of life. In civilised societies, the persons engaged in it receive the appellation of *Farmers* or *Husbandmen*, and form a distinct and useful class.

If the agriculturist would conduct his business with success, he must not confine his attention to the mere cultivation of the soil, or the rearing of vegetables; for the number of those which are found capable of affording a comfortable nourishment to the human constitution, is comparatively small, and it has been found by experience that they cannot be sown year after year on the same soil without degenerating. It is necessary, therefore, to occupy the same ground with grass of different kinds, which may at other times be more profitably devoted to vegetables. This may be given to cattle, whose ordinary and natural food it is; and thus a richer and more stimulating food than any vegetable production is obtained. It is consequently a part of the husbandman's business to rear and to feed those animals which are used as food in the society of which he is a member. Also other animals, for the sake of those services which they are capable of rendering him, for it has pleased the *Beneficent Creator of the world*, to place on it beings of a nature very subordinate to man, capable nevertheless of rendering him great assistance, without themselves being thereby degraded. These animals are (some of them), from their great strength and patience of labour, particularly useful; we might say, indispensably necessary to the cultivators of the soil in this cold and comparatively barren climate. Hence the employment of the husbandman is of a very extensive kind, and he requires much foresight, and a considerable knowledge of the relations which subsists between the most important objects in nature—the soil, the seasons, the animals, and the plants, so far as they are connected with the subsistence

of mankind. It is by bringing to perfection this art, that man becomes virtually the lord of this part of the universe, subduing by his operations every part of its surface, and acquiring over the animals which inhabit it, a solid right of dominion and property, by reason of his having reared and supported them by his skill and labour. He uses them, indeed, for food, but as they possess no foresight, and therefore cannot anticipate this catastrophe, it is to them no evil.

The art of agriculture, in this view, comprehends the nature of climate and soil, the methods of performing the different operations that are requisite in the cultivation and improvement of arable and grass lands, as inclosing, the making of fences, as hedges, ditches, walls, railings, pailings, gates, draining, paring, and burning, watering, warping, fallowing, ploughing, manuring, sowing, harrowing, weeding, hoeing; the growing and preserving of different sorts of crops, as wheat, rye, barley, oats, beans, peas, potatoes, turnips, carrots, cabbages, hops, hemp, flax, woad, madder, &c.; and the raising of various kinds of seeds, as rape, mustard, &c.; rotation of crops, reaping, mowing, stacking, thrashing; the management of artificial and natural grasses, as clover, lucern, saintfoin, tares, vetches, &c.; the converting of arable lands to grass, meadows, pastures, hay-making; the cultivating and preserving of fruits, as apples, pears, cherries, &c.; and the preparation of fruit-liquors, as cyder, perry, &c.; orchards; the planting of timber-trees, woods, coppices, plantations, &c.; the inventing of implements, as ploughs, harrows, rollers, hoes, drills, waggons, carts, mills, kilns, &c.; the construction of farm-buildings, as houses, offices, sheds, cottages; the nature of farms, tithes, leases, &c.

In a more extensive sense it also includes the breeding, rearing, feeding, and general management of all sorts of live stock, as cattle, horses, sheep, lambs, hogs, rabbits, poultry, pigeons, bees, &c.; the conducting of the various processes and preparations which have a relation to the different products obtained from them, as milk, butter, cheese, or what are generally termed cow-keeping and dairying; and lastly, as connected with political eco-

nomy, the construction of roads and canals, the forming of embankments, and the nature of weights and measures. Full accounts and explanations of these will be given under their respective heads.

Agriculture is of such antiquity, as to be coeval with the first formation of society. In the remotest ages, and amongst every people of whom we have any authentic history, we find the cultivation of the earth forming the principal employment of the inhabitants, and by all of them held in such veneration, as to have its origin ascribed to some deity or other. The Egyptians ascribe it to *Osiris*, the Phœnicians to *Dagon*, the Greeks to *Bacchus*, and the Chinese to *Fo-hi*.

Though we are destitute of authentic materials, to enable us to speak, with any degree of certainty, as to the wants of men in the rudest ages, or their means of supplying them, we have good reason to believe their sustenance was derived chiefly from the forest, the ocean, together with the milk and flesh of the few domestic animals, of which they were then in possession; and thus we find, that the districts, abounding with fish, game, and pasture, were peopled, and became the abodes of men, long before any other. It is impossible even to form a conjecture how long men continued in this situation: it probably lasted many ages; indeed, there are many nations, of which the people have no better resource even to this time.

It is obvious, that even in the most fortunate of these situations, many circumstances would occur to diminish, or even to entirely cut off the usual supply. The fisherman, for example, whose entire dependence for his own and his family's subsistence, rested on his success, if prevented either by a long continuance of stormy weather, or by the fish forsaking the coast, from procuring what was necessary, must have suffered great distress, and have been reduced to the necessity of removing to a different part of the coast, or of attempting to procure a subsistence in some other way. The unsuccessful hunter, and he who depended upon the produce of his flocks, might, owing to the scarcity of pasture, or by the attack of some disease, be in an equally unfortunate predicament.

The failure of any, or of all these re-

sources, would not only occasion great distress and difficulty, but would sometimes cost the loss of many lives, and would have operated to the almost entire extinction of the human race. Such a state of dependence on fortuitous circumstances must have been not only very unfavourable to population, but also inimical to the introduction of any of the arts connected with the comforts of society.

Frequent calamities of the kind we have mentioned, would naturally lead men to seek for articles of food that could be procured with more ease, and at the same time, afford a permanent supply throughout the year. Perhaps the curing of fish and the flesh of animals with salt, or otherwise, was among the first inventions tending to secure a winter stock of food in those ages which we are now contemplating; and certainly to people not previously acquainted with this art, the discovery was no inconsiderable step towards the improvement of their condition. The Esquimaux, and many of the tribes who inhabit the sea-coast, even to the southward of them, have no other food in summer than small fish, and the flesh of whales, seals, &c., a part of which they cure during that season, and eat it with train-oil throughout the winter.

Amongst a people unacquainted with the means of multiplying and rearing domestic animals to the proper extent (even if they possessed the art of curing their flesh), there must have been a deficiency of food, which would, as population increased, become every day more apparent, and prompt them to search for other articles. The different kinds of fruit and herbs would (in all probability) be first had recourse to, and would form no inconsiderable addition to their former resources. They would also soon perceive that both the milk and flesh of their animals were improved by good feeding in the winter. This would naturally lead to the cutting and preserving of green herbage for that purpose; hence the origin of hay.

The cultivation of grain, and the other vegetables now in use, belongs to a more advanced period of society; and many ages must have elapsed, before men, who were destitute of any other helps than those derived from experience and observation, could attain to

even an imperfect knowledge of agriculture.

Adam, indeed, was in his *early, happy* days, spared from this necessity, being placed by his Creator in a well-stored garden, which he had only "to dress and to keep;" but immediately after his fall he was driven out of this Paradise, and a new injunction was laid upon him, namely, "to till" the ground, in order that the "thorns and thistles" (which were still to grow spontaneously and to his great annoyance), might not eventually choke the better productions of the earth. By the "sweat of his brow" he cultivated the soil, so that it brought forth a sufficiency for himself and his family. His sons he instructed in the art, and they communicated it to theirs, and thus the knowledge and practice of agriculture were promulgated through the earliest ages of mankind.

When the deluge had swept from the face of the earth every vestige of human art (the ark only excepted), Noah and his descendants found themselves under the necessity of reviving the practice of husbandry, as one of the surest means of procuring the necessities and comforts of life. The methods pursued by the generations immediately after the flood are not known to us, nor the implements which they used; perhaps, the mattock and the coulter were the principal tools. It seems probable that they were not acquainted with the proper methods of restoring fertility to an exhausted soil, for we find them frequently changing their place of residence, as their flocks and herds required fresh pasturage, or their tillage land became unproductive. When the descendants of Abraham settled themselves in Palestine, agriculture began to raise itself into importance, and was regarded not only as a useful, but also as an honourable employment. Their apportionments were originally equal, and their local situation was decided by lot. The heads of the respective families were what would in the present day be termed *freeholders*. In some particulars, however, it happened with them as it does with us—some were idle, others industrious—some were, doubtless, spendthrifts, whilst others were economical, and perhaps penurious. No wonder then that in the event of a famine or an

unproductive season, they mortgaged "their lands, their houses, and their vineyards, that they might buy corn for their sons and daughters, and to enable them to pay the king's tribute" (Nehem. v. 2). Some of them were unable to redeem their possessions, and some families became extinct; by all which means an inequality would as a matter of course ensue. Boaz came into possession of three estates by inheritance, as also of a wife, after much curious ceremony. Large estates, however, were not frequent; an interdict being laid upon those "who joined house to house, and laid field to field," by the Prophet Isaiah. Two things are very remarkable in the manners and customs of the Jews, in connexion with this subject; *first*, the inviolability of individual property, however obscure that individual was; as in the case of Naboth, whose vineyard might not lawfully be possessed, even by the King of Israel, without his consent; and, *secondly*, that notwithstanding a man's necessities (however brought about) might induce him to make over his patrimony to a stranger, yet at a certain fixed period (even at the appointed year of Jubilee), the inheritance was to be yielded up free and unincumbered. Each proprietor seems to have cultivated his own lands, however extensive, and the art of agriculture was held in high esteem even by their princes. King Uzziah (it is recorded), "built towers in the desert, and digged many wells, for he had much cattle both in the low country, and in the plains; for he loved husbandry" (2 Chron. xxvi. 10). Elijah found Elisha in the field, with twelve yoke of oxen, and himself with the twelfth. Job had five hundred yoke of oxen, and five hundred she asses, seven thousand sheep, and three thousand camels. Both oxen and asses were used by the Jews in the labours of the field, but they were not allowed to be yoked together, nor was this prohibition in any way prejudicial, their step being by no means similar, their progress must of necessity have been much impeded. The plough used by them, was in all probability a clumsy instrument, requiring much more care and attention than that in present use, for a careless, negligent ploughman, looking behind him whilst at his work, is used as an emblem of a worthless

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man, totally unfit for, as well as unworthy of, the kingdom of God. Corn was threshed by different methods. The flail, the cart-wheel, and even the hoofs of living horses were used for different sorts of grain. Isaiah mentions "the digging of wells with the mattock." Moses gave directions to the Jews for cultivating the vine and other fruit-trees, the object of which was twofold; *first*, that the tree should be suffered to establish itself well in the soil before it were impoverished for the sake of a premature production; and *secondly*, to induce in their minds a pious regard to the bountiful giver of this, and of every other good gift. By most of the eastern nations, agriculture seems to have been particularly attended to and encouraged from the most early periods. That the Japanese were extremely interested in its promotion, is evinced by the great care taken by them in collecting and preserving all sorts of manures: and amongst the Chinese it has constantly received the distinguished regard and protection of their princes and nobility, and has been considered by them as the most honourable and important of all employments. The use of the drill, which has but lately been introduced and adopted in European countries, is said to have been long known and employed by them. It may be proper to observe, that the long duration of the Chinese empire, and form of government, which has no equal in history, as also the riches and prosperity of that country, are to be ascribed in a great measure, if not entirely, to the perfection of their agriculture, and the ample supply of every necessary of life thereby produced. Their rural economy being of the most minute and perfect kind, demands the labour of a number of hands, greatly exceeding what are employed in almost any other part of the world. The produce, however, is great in proportion; and at this day, it is computed that nearly seven eighths of the inhabitants of China are artisans, and owe the necessaries of life to the labour of the remainder; this great majority being employed in arts, manufactures, and commerce. The Chaldeans are found to have carried this valuable art to a great degree of advancement; they cultivated their lands with great assiduity, and enjoyed the pleasing satisfaction of re-

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ceiving plentiful harvests from their fields. Of the ancient Persians, it is related on the most respectable authority, that their kings were wont to lay aside their grandeur once in every month, to eat with their husbandmen. The Egyptians also, who, from the fertility of their country, caused by the annual overflowings of the Nile, raised prodigious quantities of corn, were so sensible of the blessings resulting from agriculture, that they ascribed the invention of it to Osiris, and even carried their superstitious gratitude so far, as to worship those animals that laboured in tilling the ground. The Phœnicians were also famous for their skill in agriculture; but finding themselves too much confined in their native country, by the conquests of neighbouring nations, they spread themselves through the greater part of the islands of the Mediterranean, and carried with them their knowledge in husbandry. The Carthaginians following the taste of their ancestors, are said to have applied themselves assiduously to the study of agriculture. Mago, their famous general, wrote no less than twenty-eight books on that subject, which Columella tells us, were translated into Latin by an express decree of the Roman senate; and Servius adds, that Virgil used these books as a model when he wrote his *Georgics*. The art of sowing corn, and the tillage of land, were probably invented in Sicily; as that island was very fruitful in corn, and agriculture was there esteemed so honourable an employment, that even their kings did not disdain to practise it with their own hands. The Athenians, who were the first people that received any tincture of politeness, taught the use of corn to the rest of the Greeks; they also taught them the manner of cultivating the ground, and preparing it for seed. The Greeks soon perceived that bread was more wholesome, and its taste more delicate than acorns, and accordingly thanked the gods for such an unexpected and beneficial present. After this, the Athenian kings, thinking it more glorious to govern a small state wisely, than to aggrandize themselves by foreign conquests, withdrew their subjects from war, and employed them solely in cultivating the earth. This constant application carried agriculture to a consi-

derable degree of advancement, and brought it to a more perfect art.

Hesiod, who is generally thought to have been contemporary with Homer, was the first among the Greeks who wrote on this subject. He called his poem *Weeks and Days*, because agriculture requires an exact observance of times and seasons. The other eminent Greek writers upon agriculture, are Democritus of Abdera, Socrates, Xenophon, Tarentinus, Architas, Aristotle, and Theophrastus, from whom the art received considerable improvements, as also from Hieron, Epicharmus, Philometer, and Attalus.

The ancient Romans esteemed agriculture such an honourable employment, that, in the earliest times of the republic, the highest praise that could be given to a man, was to say of him, that he cultivated well his own spot of ground. The most illustrious senators applied themselves to this profession; nor had they either splendour or majesty, but when they appeared in public. And their greatest generals, at their return from the toils of war, from taking of cities, and subduing of nations, were impatient till they were again employed in cultivating their lands; and thought it no disgrace to follow the plough, though they were at the same time prepared to serve the wants of the republic, attend her councils, or put themselves at the head of her armies. It must indeed be allowed, that when the Romans became tainted with the luxury of Asia, they gradually lost the noble simplicity of their ancestors, and employed their slaves in the severer labours of a country life. But though they did not themselves hold the plough, yet even men of consular dignity looked upon it as a reward for their public services, when they obtained leave to retire into the country; and were equally respected when overlooking their farms, as when seated in the chair of magistracy. M. Cato, the censor, that illustrious Roman general, orator, politician, and lawyer, after having governed provinces, and subdued nations, did not think it below his station to write a large treatise on agriculture.

This work, according to Servius, was dedicated to his own son, and was the first Latin treatise on that subject. It has been handed down to us, it is said, in all its purity, and in the same manner

that Cato wrote it. Varro composed a treatise on the same subject, but on a more regular plan. This work is embellished with all the Greek and Latin erudition of that learned author. Agriculture also received great improvements from the two Sasernaes, and likewise from Scorfa, Tremellius, and M. Terentius. Virgil has adorned it with the language of the Muses, and given it majesty by his verse. He has finely embellished those precepts of husbandry which were left by Hesiod and Mago. The perusal of Virgil's *Georgics*, affords an undeniable testimony as to the perfection of the Italian husbandry. In that interesting work, the wheel-plough, the harrow, the flail, the scythe, the reaping-hook, together with every other instrument now in use, are accurately described, as also the system of cultivation pursued. Considering the period when Virgil penned his *Georgics*, and the great difference of climate between Italy and Britain, the similarity between the system he lays down, and our modern husbandry, is astonishing. Fallowing and irrigation, with their benefits, are particularly described, as are also the advantages arising from alternate green and white crops. His accounts of the different kinds of domestic animals is equally beautiful and correct.

Columella, who flourished in the reign of the Emperor Claudius, wrote twelve books on husbandry, which contain a variety of interesting facts and observations. He was a native of Boetica, in Spain, and had devoted much time to the study of rural affairs.

From this period, till the reign of Constantine IV., husbandry appears to have been in a declining state, when that wise emperor caused a large collection of the most useful precepts, relating to the art, to be extracted from the best writers, and published under the title of *Geoponics*. Some say he made this collection with his own hand. Nor is this at all improbable, as it is well known that, after he had conquered the Saracens and Arabians, he not only practised, but studied the arts of peace, fixing his chief attention on the advancement of agriculture.

But from the time of Constantine IV. till about the year 1478, it lay in a kind of dormant and neglected state, when Crescenzio, an Italian, revived it by

publishing an excellent performance on the subject at Florence. He was soon followed by several of his countrymen, among whom Tatti, Stefano, Augustino, Gallo, Sansovino, Lauro and Tarello, deserve to be particularly noticed.

In 1584, Pope Sextus (according to Harte), forced his subjects to work, that they might pay the heavy taxes imposed on them; and by this means rendered them happy and contented, and himself rich and powerful. The result was satisfactory to all parties, for whereas he found them sunk in sloth and overrun with pride and poverty, and lost to all sense of civil duties, he recovered them from that despicable state by means of industry, by which they ultimately came to enjoy plenty and regularity. None, however, but a great genius could have brought this about. The maxim he acted upon was this, "A people not oppressed by taxes are apt to grow indolent!!! whilst industry is the only source of riches and prosperity."

During the eighteenth and nineteenth centuries, agriculture has attained to a very considerable degree of perfection in some districts of Italy. The great advantage that country possesses over the rest of Europe, in an agricultural point of view, is its climate; for though, it is, in point of health and agreeableness, one of the worst in the world; yet the cool temperature of some of the northern districts admits of the finest pastures; while, from the warmth of others, the rocky sides of hills are as productive of grapes and olives as the plains are in corn.

According to the reports of Mr. Jacob, in his *Tracts relating to the Corn Trade and Corn Laws*, who has had access to the best sources of information, in addition to his own observation—according to this gentleman, the present state of the agriculture of the greater part of the continent of Europe is not very different from what it was in Britain during the prevalence of the feudal system. "The greater part of France," he says, "a still much greater portion of Germany, and nearly the whole of Prussia, Austria, Poland, and Russia, present a wretched uniformity of system. It is called the three-course husbandry; consisting first, of one year's clean fallow; secondly, winter corn, chiefly rye, with a proportion of wheat commensurate to the manure that can

be applied; thirdly, summer corn, or barley and oats. There are occasional and small deviations from this system. In some few cases *potatoes*, in others *peas* are grown in the fallow year, but they are only minute exceptions to the generally established system. It is not surprising, that under such a system, the produce should not be much more than four times the quantity of seed, at which rate it is calculated, as appears to be rightly, by Baron Alexander Humboldt.

"The fields are almost universally unclosed and exposed to the most injurious effects of a changeable and an intemperate climate. The ancient feudal system of tenure is still continued, modified indeed, and softened in some few parts, but not to a degree or to an extent that deserves to be taken into account in the view now under consideration, of the countries as a whole. The peasants are for the most part *odstricti gleba*; and where by recent laws, their condition has been changed, the practical effect has yet hardly had time to exhibit any observable improvement in their state. Labour, whether of man or beast, is usually exchanged for occupancy of land; and hence the labour is performed in the most negligent and imperfect manner, that the vigilance of an overseer who cannot be every where present will allow.

"The lords of the soil, besides their demesnes, have the right of pasturage on the fields of their tenants, from harvest to the next seed time. Hence, none of intervening crops, which tend to enrich the soil, can be cultivated without infringing on their rights.

"Among the cultivators of the land, little or no accumulation of capital has been formed: from the lord to the lowest grade of the peasantry all are alike destitute of disposable funds. The lords are only rich in lands, and sufficiently at their ease, if that land be unencumbered with mortgagees and annuities. The peasants, whether owners of the live stock and of the implements, or having the use of them with the land from its owners, are content to live on from year to year, eating their own produce, growing their own wool and flax, and converting them into garments. They are quite satisfied if they can dispose of as much surplus produce as will pay the small share of

money-rent which becomes due to their lord."

At what time agriculture was introduced into Britain, is uncertain. When Julius Cæsar first invaded this island, it was not wholly unknown. That Conqueror was of opinion, that agriculture was first introduced by some of those colonies from Gaul which had settled in the southern parts of Britain, about one hundred years before the Roman invasion. The establishment of the Romans in Britain, produced great improvement in agriculture, inasmuch, that prodigious quantities of corn were annually exported from the island; but, on the Romans quitting Britain, it was invaded by the Saxons, a ferocious and ignorant people, by whom agriculture and all other civilized arts were neglected. The unhappy Britons were driven from those parts of the country which were most proper for cultivation. The Saxon princes and great men, who, in the division of the lands, had received the greatest shares, subdivided their estates into two parts, which were called the *in-lands* and the *out-lands*. The in-lands were those which lay most contiguous to the mansion-house of their owner, which he kept in his own immediate possession, and cultivated it by his slaves, under the direction of a bailiff, for the purpose of raising provisions for his family. The out-lands were those which lay at a greater distance from the mansion-house, and were let to the *ceorls* or farmers of those times at a certain rent, which was very moderate, and generally paid in kind.

By the laws of Ina, king of the West Saxons, who reigned about the end of the seventh or beginning of the eighth century, a farm consisting of ten hides was to pay the following rent, *viz.* ten casks of honey, three hundred loaves of bread, twelve casks of strong ale, thirty casks of small ale, two oxen, ten wethers, ten geese, twenty hens, ten cheeses, one cask of butter, five salmon, twenty pounds of forage, and one hundred eels. In one of Strutt's plates of ancient dresses, entitled *Saxon Rarities of the Eighth Century*, may be seen a picture of a Plough and Ploughman (see plate). The venerable Bede, in his life of Easterwin, Abbot of Weremouth, tells us, "that this abbot, being a strong man, and of an humble disposition, used to assist his monks in

their rural labours, sometimes guiding the plough by its stilt or handle, sometimes winnowing corn, and sometimes forging instruments of husbandry with a hammer upon an anvil." The conquest of England by the Normans contributed very much to the improvement of agriculture; for by that event many thousands of husbandmen, from the fertile and well cultivated plains of Flanders, France, and Normandy, settled in this island, obtained estates or farms, and employed the same methods in the cultivation of them, that they had used in their native countries. The implements of husbandry, used at this time were of the same kind with those that are employed at present; but some of them were less perfect in their construction. One sort of plough, for example, had but one stilt or handle, which the ploughman guided with one hand, having in his other hand an instrument which served both for cleaning and mending his plough.

We are, after all, very much in the dark with respect to the state and progress of agriculture in Great Britain, previous to the fourteenth century. That it was pretty generally practised, especially in the eastern, south, and midland parts of England, is certain; but of the mode, and the success, we are left almost entirely ignorant. In a work by Sir John Fortescue, written in the fifteenth century (in praise of the English laws), he mentions the progress that had been made in planting hedges and hedge-row trees before the end of the fourteenth century. In the law book, called *Fleta*, supposed to have been written in 1340, very particular directions are given as to the most proper times and best way of ploughing and dressing fallows. Rules are also given for the changing and choosing seed;—for proportioning the quantity of different kinds of seed to be sown on an acre, according to the nature of the soil and degree of richness;—for collecting and compounding manures, and accommodating them to the ground on which they are to be laid;—for the best seasons for sowing seeds of different kinds on all the variety of soils;—and for performing every operation in husbandry, at the best time and in the best manner: in the same work, the duties and business of the steward, bailiff, and overseer of a manor, and of

all the other persons concerned in the cultivation of it, are explained at full length, and with so much good sense, that if they were well performed the manor could not but be well cultivated. These works (as well as others of the kind) were written in Latin, and even the farming accounts were in those days kept in that language. During the greater part of the fifteenth century, England was engaged in civil wars, and agriculture as well as other arts declined. The practice of inclosing became very general in England about this period. The prelates, lords, and gentlemen, converting the lands round their castles into pasture grounds, occasioned prodigious clamours, and the enclosing continuing, an act was passed to stop its progress in the beginning of the reign of Henry VII. The dearths of this period are a proof of the low state of agriculture. Wheat in 1437 and 1438, rose from four shillings or four shillings and sixpence, the ordinary price per quarter, to sixteen pounds six shillings and eightpence, of our money. Stowe observes, that in these extremities the common people endeavoured to preserve their wretched lives by drying the roots of herbs and converting them into a kind of bread.

The first treatise in English on husbandry, appeared during the reign of Henry VIII., by Sir A. Fitzherbert, judge of the Common Pleas, who shone with unrivalled lustre in the practical parts of agriculture. He published two treatises on this subject; the first, which appeared in 1534, was entitled *The Book of Husbandry*, and the second in 1539, called *The Book of Surveying and Improvements*. As the observations and instructions contained in these works were the result of much experience, they excited great attention to the subject, and soon raised a spirit of emulation in his countrymen, in consequence of which many treatises of the same kind successively appeared; but time has deprived us of many of these writings; or at least they are become so very scarce, as only to be found in the libraries of the curious. It may surprise some of the agriculturists of the present day to be told, that, after a lapse of almost three centuries, Fitzherbert's practice, in some material branches, has not been improved upon; and that in several districts abuses still

exist, which were as clearly pointed out by him at that early period, as by any writer of the present age.

The *Book of Surveying* relates to castles, woods, parks, mills, and other branches of property; and also contains numerous advices concerning the best way of improving arable land.

The *Book of Husbandry* contains minute directions for ploughing, managing and cropping land, together with a full account of the diseases which affect horses and other animals, and the method of curing them.

Sir Anthony Fitzherbert laying it down as a primary principle, that the majority of husbandmen live by the plough, describes the several implements generally used in his time for tilling the ground. He then points out the other articles that belong to a team of horses; and when speaking of carts and waggons, very properly recommends that the wheels on which they are mounted be shoed or bound about with iron, whence it may be inferred, that wheels altogether composed of wood, were at that time commonly used. It would appear that the husbandman, in his days, combined a knowledge of every profession; for among the appendages of a plough, we find an axe, hatchet, hedge-bill, auger, flail, spade, and shovel, particularly enumerated. He also recommends that young husbandmen should learn to make their yokes, ox-bows, stools, and all manner of plough geare lest the purchase of these articles should be too costly for them. He seems to have preferred oxen rather than horses, in executing rural labour, though he frankly admits that horses go faster than oxen over even and light ground, and that they are quicker for all sorts of carriage-work. "And ouer and beside all this boke," says he, "I will aduise him to rise betime in the morning according to the verse spoke of 'Sanat sanctificat, et ditat surgere mane,' and to go about his closes, pastures, fieldes, and specially by the hedges, and to haue in his purse a payre of tables, and whan he seeth any thing, that wolde be amended, to wryte it in his tables, as if he fynde any horses, mares, beastes, shepe, swyne, or geese, in his pastures, that be not his owne; and peradventure thoughte they be his owne, he wolde not haue them to goo there, or to fynde a gap, or a

sherde in his hedge, or any waters standynge in his pastures uppon his grasse, whereby he may take double hurte, bothe losse of his grasse, and rotting of his shepe and calues. And also of standynge water in his corne-fieldes, at the landes endes or sydes, and howe he wolde haue his landes plowed, dounced, sturred, or sowed; and his corne wedded or shorne, or his cattell shifted out of one pasture into another; and to loke what dyching, quiesettyng, or plashing is necessary to be had; and to ouersee his shepherd, how he handleth and ordreth his shepe, and his seruantes howe they plowe and do theyr warkes; or if any gate be broken down or want any staues, and go not lightly to open and tyne, and that it do not traise, and that the windes blowe it not open, with many mo necessary thynges that are to be lokd upon. For a man alwaye wanderynge or goinge aboute somewhat, fyndeth or seeth that is amysse, and wolde be amended. And as soone as he seeth any such defautes, than let hym take oute his tables, and wryte the defautes. And whan he commeth home to diner, supper, or at nyght, than let hym call his bayely, or his heed seruante, and soo shewe hym the defautes, that they may be shortly amended. And whan it is amended, than let hym put it out of his tables. For this used I to doo X or XI yerres and more; and thus let hym use dayely, and in shorte space he shall sette moche thynges in good order, but dayely it will haue mendynge. And yf he canne not wryte, lette hym nycke the defautes uppon a stycke, and to shewe his bayely, as I sayde before. Also take hede, bothe erly and late, at all tymes, what manner of people resorte and comme to thy house, and the cause of theyr commynge, and especially if they brynge with them pytchers, cannes, tancarδες, bottelles, bagges, wallettes, or bushell pokes; for if thy seruantes be not true they maye doo thee great hurte, and themselfe lyttel anauntage; wherfore they wold be well lokd upon. And he that hath ii true seruantes, a man seruante, and an other a woman seruante, he hath a great treasure, for a trewe seruante wyl doo justly hymself, and if he se his felowes do amysse, he wyl byd them do no more so, for, if they do, he wyll shewe his master therof; and

if he do not this, he is not a trewe seruante." We have "a prolounge for the wive's occupation," in some instances rather too homely for the present time. Among other things, she is "to make her husband and herself some clothes; and she may have the locke of the shepe, either to make blankettes, and coverlettes, or both." This is not so much amiss, but what follows will bring our learned judge into disrepute, even with our most industrious house-wives. "It is a wive's occupation to wynowe all manner of cornes, to make malte, to waishe and wrynge, to make haye, shere corne, and, in time of need, to helpe her husbände to fyll the mucke wayne or dounge carte, drive the ploughe, to loade hey, corne, and suche other. And to go or ride to market, to sel butter, chese, mylke, egges, chekyns, capons, hennes, pygges, gese, and all manner of cornes."

The *Book of Surveying* adds considerably to our knowledge of the rural economy of that age. "Four maner of commens" are described; several kinds of mills for corn, and other purposes, and also "quernes that goo with hand;" different orders of tenants, down to the "boundmen" who "in some places contynue as yet;—and many tymes, by color thereof, there be many freemen taken as boundmen, and their lands and goods is taken from them." Lime and marl are mentioned as common manures, and the former was sometimes spread on the surface to destroy heath. Both draining and irrigation are noticed, though the latter but slightly. And the work concludes with an inquiry "How to make a township that is worth xx marke a yere worth xxli a yere;" this is to be done by enclosing, by which he says live stock may be better kept, and without herbs; and the closes or fields alternately cropped with corn, and "let lye" for a time.

The next author, who writes professedly on agriculture is Tusser, whose *Five Hundred Points of Husbandry*, published in 1562, was formerly in such high repute as to be recommended by Lord Molesworth to be taught in schools. Amidst a vast heap of rubbish there are some useful notices concerning the state of agriculture at the time in different parts of England. Hops which had been introduced in the

early part of the sixteenth century, and on the culture of which a treatise was published in 1574, by Reynolde Scott, are mentioned as a well-known crop. Buck-wheat was sown after barley. It seems to have been the practice then, in some places to "geld fillies" as well as colts. Hemp and flax are mentioned as common crops. Inclosures must have been numerous in some counties, and there is a very good comparison between "champion" (open fields) and "country" several of which Blythe afterwards transcribed into his *Improver Improved*. Carrots, cabbages, turnips, and rape, are mentioned among the herbs and roots for the kitchen. There is nothing to be found in Tusser about serfs or bondmen, as in Fitzherbert's works. This author's division of the crop is rather curious, though probably quite incorrect, if he means that the whole rent might be paid by a tenth of the corn.

"One part cast forth for rent due out of hand,
One other part for seed to sow thy land,
Another part leave parson for his tith,
Another part for harvest, sickle, and sith,
One part for the plough-write, knacker, and smith,
One part to uphold thy teemes to draw therewith,
Another part for servant and workman's wages laie,
One part likewise for fillbellie day by day,
One part thy wife for needful things doth crave,
Thyself and thy child the last part would have."

The condition of a yeoman, before or about Queen Elizabeth's time, is exemplified in the case of Bishop Latimer's father. "My father," says Hugh Latimer, "was a yeoman, and had no land of his own; only he had a farm of three or four pounds by the year at the utmost; and hereupon he tilled so much as kept half a dozen men. He had a walk for a hundred sheep, and my mother milked thirty kine, &c. He kept his son at school till he went to the university, and maintained him there; he married his daughters with five pounds, or twenty nobles, a-piece; he kept hospitality with his neighbours, and some alms he gave to the poor; and all this he did out of the said farm."

According to Harrison, the geographer, a farmer "will thinke his gaines very small towards the end of his terme, if he have not six or seven years' rent lying by him, therewith to purchase a new lease; beside a fair garrish of pewter on his eupboard, with as much more in odd vessels going about the house; three or four feather-beds; so many coverlets, and carpets of tapes-

trie; a silver salt; a bowle for wine, if not a whole neast; and a dozen of spoones to furnish owte the sute."

Cattle were not plentiful in England at this period, as in 1563 it was enacted, that no one should eat flesh on Wednesdays and Fridays, on forfeiture of three pounds, unless in case of sickness, or of special license, neither of which were to extend to beef or veal. Great pains were taken in the act to prove that it was a political, not a religious measure. As to the number of horses in the realm, some judgment may be formed from the quota which Elizabeth, when she moved her place of residence, demanded from the country in the neighbourhood of her palace. This was twenty-four thousand; "a far less traine," says Harrison, "than those of the kings of other nations." He also extols the height and strength of the English draught horses; five or six of them he says, will with ease draw three thousand weight of the greatest tale for a long journey.

Sir John Norden's *Surveyor's Dialogue*, printed in 1607, is a work of considerable merit. The first three books of it relate to the rights of the lord of the manor, and the various tenures by which landed property was then held, and the obligations which they imposed: among others, we find the singular custom, so humorously described in the *Spectator*, about the incontinent widow riding upon a ram. In the fifth book, there are a good many judicious observations on the "different natures of grounds, how they may be bettered, reformed, and amended." The famous meadows near Salisbury are mentioned; and when cattle have had their fill, hogs, it is pretended, "are made fat with the remnant, namely with the knots and sappe of the grasse." So many extravagant assertions have been made about these meadows by several of our early writers, that we ought to receive their statements with some degree of scepticism, wherever they seem to approach the marvellous. "Clover-grass, or the grasse honeysuckle" (white clover) is directed to be sown with other hay-seeds. "Carrot-roots" were then raised in several parts of England, and sometimes by farmers; and leases of twenty-one years are recommended for persons of small capital, as better than in employing it in purchasing land; an opinion that prevails very generally

among our present farmers. In Sir Richard Weston's *Discourse on the Husbandry of Brabant and Flanders*, published in 1645, we may mark the dawn of the vast improvements which have since been effected in Britain. This gentleman was ambassador from England to the Elector Palatine and King of Bohemia, in 1619, and had the merit of being the first who introduced the great clover, as it was then called, into English agriculture. He says, "he saw it cutting near Antwerp on the first of June, 1614, being then two feet long, and very thick; he saw it cut again on the 29th of the same month, being twenty inches long; and a third time in August, being eighteen inches long." *Blythe's Improver Improved* (first published in 1649) is the first systematic work in which there are some traces of the convertible husbandry, so beneficially established since, by interposing clover and turnip between culmiferous crops. He is a great enemy to commons and common fields, and retaining land in old pastures, unless it be of the best quality. His description of ploughs is interesting; and he justly recommends such as were drawn by two horses (some even by one horse) in preference to the weighty clumsy machines which required four horses or oxen, or more. All the manures now used seem to have been well known; and he brought lime himself from a distance of twenty miles. He speaks of an instrument which ploughed, sowed, and harrowed, at the same time; and the *setting of corn* was then a subject of much discussion. "It was not many years," says Blythe, "since the famous City of London petitioned the Parliament of England against two nuisances or offensive commodities, which were likely to come into great use and esteem; and that was Newcastle coal in regard of their stench, &c. and hops, in regard they would spoyle the taste of dryncke, and endanger the people."

Our fatal domestic wars, during the reign of Charles I., changed the instruments of husbandry into martial weapons; but after the death of that unfortunate monarch, artful and avacious men crept into the confiscated estates of the nobility, gentry, and clergy; and as many of these new encroachers had risen from the plough, so they returned with pleasure to their old

profession, being chiefly animated by a love of gain. Plattes, Hartlib, Blythe, and others, seized this favorable disposition of the common people, and encouraged it by writings, which have since had few to equal them; nor was Cromwell wanting in lending his assistance in this important business. Sir Hugh Platt was one of the most ingenious husbandmen of the age in which he lived; and so great was his modesty, that all his works, except his *Paradise of Flora*, seem to be posthumous. He held a correspondence with all the lovers and promoters of agriculture and gardening in England; and such was the justice and honesty of his temper, that he always named the author of every discovery that was communicated to him. Perhaps no man, in any period in the history of the art, discovered, or at least brought into use, so many new sorts of manure, as his account of the compost and covered dunghill, and his observations on the fertilizing qualities, contained in salt, street dirt, and the sullage of streets in great cities, clay, fuller's-earth, moorish earth, dunghills made in layers, fern, hair, burned vegetables, malt-dust, willow-tree earth, soap boilers' ashes, marle, and broken pilchards, sufficiently demonstrate.

Gabriel Plattes may likewise be esteemed an original genius in promoting the improvement of agriculture. He began his valuable observations in the time of Queen Elizabeth, and continued them through the reigns of James I. Charles I. and during the first three or four years of the commonwealth. But notwithstanding the great merit displayed in his writings, the public shamefully suffered him to starve and perish in the streets of London, not having a shirt upon his back when he died.

Samuel Hartlib, a celebrated writer on husbandry, was highly beloved and esteemed by Milton, and other ingenious men of that time. In his preface to a work commonly called his *Legacy*, first published in the year 1650, he laments that no public director of husbandry was established in England by authority; and that we had not adopted the Flemish method of letting farms upon improvement. These observations of Hartlib procured him a pension of one hundred pounds a year from Cromwell, who was a great fa-

vourer of agricultural improvements, and the writer afterwards, the better to fulfil the intentions of his benefactor, procured Dr. Beati's excellent annotations on the *Legacy*, with several other valuable pieces from his numerous correspondents. The period in which this author flourished appears to have been an æra when English husbandry rose to great perfection; for the preceding wars had made the country gentry poor, and, in consequence, more industrious. They found the cultivation of their own lands to be the most profitable post they could occupy. But a few years afterwards, when the Restoration took place, all this industry and knowledge became useless, from the new system that was acted upon, and were exchanged for heedlessness and dissipation; from which husbandry passed almost entirely into the hands of common farmers. But the famous work usually attributed to Hartlib, and called the *Legacy*, was only drawn up at his request; and, after passing through his correction and revision, published by him. The real author of the treatise, which consists of one general answer to the following question: "What are the actual defects and omissions, as also the possible improvements, in English husbandry?" was a person of the name of R. Child, who seems to have been acquainted with many ingenious improvers of agriculture at that period. Several other pieces succeeded the publication of the *Legacy*, which greatly improved and augmented the means of cultivation.

Grew, by the publication of the *Anatomy of Plants*, and showing, in some measure, the economy of the vegetable system, contributed to enlarge the views and extend the enquiries concerning the nature of vegetation and the food of plants. But a principal writer, who inspired his countrymen with a desire of reviving the study of agriculture after the Restoration, was Evelyn; who, being followed by Duckett, Ray, Dugdale, and several other authors, the art of cultivation was greatly recovered, and some new improvements introduced; and the establishment of the Royal Society, which took place a few years afterwards, contributed still more fully to the advancement of it, by serving as a focus for collecting and recording valuable materials on the nature

of vegetation and the principles of agriculture, as well as other subjects. About the year 1703, many additions and improvements were made in this useful art. Mortimer, by his explanations of various practical modes of management; Bradley, by reducing the facts on vegetation into a more systematic order; Hales, by his valuable statistical experiments and investigations; and Miller, by the publication of his *Dictionary*, and other works, contributed very materially. But agriculture is probably still more indebted to the exertions of Tull, notwithstanding the evident futility of many of his positions, as by showing the utility and importance of drilling, and frequent hoeing or stirring the ground about the roots of plants, and thereby keeping them clean and free from weeds, farmers have been induced to adopt more clean and sure methods of cultivating their arable lands. The introduction of this system of management, therefore, in some degree, forms an æra in the history of English husbandry.

Tull's *Theory* is promulgated with great confidence, and in the controversy which he thought proper to maintain in its support, he scrupled not to employ ridicule as well as reasoning. Besides the Roman writers, *de Re Rustica*, Virgil in particular, whom he treats with high disdain; he is almost equally severe on Dr. Woodward, Bradley, and other writers of his own time.

Tull begins by showing that the roots of plants extend much further than is commonly believed, and then proceeds to inquire into the nature of their food. After examining several hypothesis, he decides this to be fine particles of earth. The chief, and almost the only use of dung, he thinks, is to divide the earth; to dissolve the "terrestrial matter, which affords nutriment to the mouths of vegetable roots;" and this can be more completely done by tillage. It is therefore necessary, not only to pulverise the soil by repeated ploughings before it be seeded; but as it becomes gradually more and more compressed afterwards, recourse must be had to tillage whilst the plants are growing, or horse-hoeing; which also destroys the weeds that would deprive the plants of their nourishment.

The leading features of Tull's *Husbandry*, are his practice of laying the

land into narrow ridges of five or six feet, and upon the middle of these, drilling one, two, or three rows; distant one from another about seven inches, when there were three; and ten when only two. The distance of the plants on one ridge from those on the contiguous one, he called an *interval*; the distance between the rows on the same ridge he called a *space*, or *partition*; the former was stirred repeatedly by the horse-hoe, and the latter by the hand-hoe.

The extraordinary attention Tull gave to his mode of culture is, perhaps, without a parallel. "I formerly was at much pains," he says, "and at some charge in improving my drills, for planting my rows at very near distances; and had brought to such perfection, that one horse would draw a drill with eleven shares, making the rows at three inches and a half distance from one another; and, at the same time, sow in them three very different sorts of seeds, which did not mix; and these too, at different depths. As the barley-rows were seven inches asunder, the barley lay four inches deep. A little more than three inches above that, in the same channels, was clover; betwixt every two of these rows, was a row of saintfoin, covered half an inch deep. I had a good crop of barley the first year; the next year, two crops of broad clover, where that was sown, and where hop-clover was sown, a mixed crop of that and of saintfoin; but I am since, by experience, so fully convinced of the folly of these, or any other mixed crops, and more especially of narrow spaces, that I have demolished these instruments (in their full perfection) as a vain curiosity, the drift and use of them being contrary to the true principles and practice of horse-hoeing."

In the culture of wheat, he began with ridges six feet broad, or eleven on a breadth of sixty-six feet; but on this he afterwards had fourteen ridges. After trying different numbers of rows on a ridge, he at last preferred two, with an intervening space of about ten inches. He allowed only three pecks of seed for an acre. The first hoeing was performed by turning a furrow from the row, as soon as the plant had put forth four or five leaves; so that it was done before, or at the beginning of winter. The next hoeing was in spring,

by which the earth was returned to the plants. The subsequent operations depended upon the circumstances and condition of the land, and the state of the weather. The next year's crop of wheat was sown upon the intervals which had been unoccupied during the former year; but this he does not seem to think was a matter of much consequence. "My field," he observes, "on which is now my thirteenth crop of wheat, has shown that the rows may successfully stand upon any part of the ground. The ridges of this field were, for the twelfth crop, changed from six feet to four feet six inches. In order for this alteration, the ridges were ploughed down, and then the next ridges were laid out the same way as the former, but one foot six inches narrower, and the double rows drilled on their tops; whereby, of consequence, there must be some rows standing on every part of the ground, both on the former partitions, and on every part of the intervals. Notwithstanding this, there was no manner of difference in the goodness of the rows; and the whole field was in every part of it equal, and the best, I believe, that ever grew on it. It is now the thirteenth crop, likely to be good, though the land was not ploughed cross-ways."

According to Tull, a rotation of crops of different species was altogether unnecessary; and he labours hard to prove, against Dr. Woodward, that the advantages of such a change, under his plan of tillage, were quite chimerical; although he seems to admit the benefit of a change of the seed itself. But the best method of determining this question would have been, to have stated the amount of his crops per acre, and the quality of the grain, instead of resting the superiority of his management on the alleged saving of expense, when compared with the common broad cast husbandry.

On the culture of the turnip, both his principles and his practice are much more correct. The ridges were of the same breadth as for wheat, but only one row was drilled on each. His management, while the crop was growing, differs very little from the present practice. When drilled on the level, it is impossible, he observes, to hoe-plough them so well as when planted upon ridges. But the seed was deposited at

different depths, the half about four inches deep, and the other half exactly over that, at the depth of half an inch. "Thus planted, let the weather be never so dry, the deepest seed will come up; but if it raineth immediately after planting, the shallow will come up first. We also make it come up at four times, by mixing our seed half new and half old, the new coming up a day quicker than the old. These four comings-up give it so many chances for escaping the fly; it being often seen that the seed sown over night will be destroyed by the fly, when that sown the next morning will escape, and *vice versa*: or you may hoe-plough them when the fly is like to devour them; this will bury the greatest part of these enemies: or else you may drill in another row without new-ploughing the land."

Drilling, and horse and hand-hoeing seem to have been in use before the publication of Tull's book. "Hoeing," he says, "may be divided into deep, which is our horse-hoeing; and shallow, which is the English hand-hoeing; and also the shallow horse-hoeing used in some places betwixt rows, where the intervals are very narrow, as sixteen or eighteen inches. This is but an imitation of the hand-hoe, or a succedaneum to it, and can neither supply the use of dung nor fallow, and may be properly called scratch-hoeing." But in his mode of forming ridges, his practice seems to have been original; his implements display much ingenuity; and his claim to the title of *father of the present horse-hoeing husbandry of Great Britain* seems indisputable. A translation of Tull's book was undertaken at one and the same time in France, by three different persons of consideration, without the privity of each other. Two of them afterwards put their papers into the hands of the third, M. du Hamel du Monceau, of the *Royal Academy of Sciences at Paris*, who published a *Treatise on Husbandry*, on the principles of Mr. Tull, a few years after. But Tull seems to have had very few followers in England for more than thirty years. The present method of drilling and horse-hoeing turnips was not introduced into Northumberland till about the year 1780; and it was then borrowed from Scotland, the farmers of which had the

merit of first adopting Tull's management in the culture of this root about the year 1760; and from whom it has since made its way, but slowly, into the southern parts of the island.

The gradual advance in the price of land-produce, soon after the year 1760, occasioned by the increase of population, and of wealth derived from manufactures and commerce, has given a more powerful stimulus to rural industry, augmented agricultural capital in a greater degree, and called forth a more skilful and enterprising race of cultivators, then all the laws for regulating the corn-trade could ever have effected. Most of the inventions for increasing produce and economising labour, have either been introduced, or improved and greatly extended, since that time; and by means of both, the free surplus has been vastly increased for the supply of the general consumption. The passing of more than three thousand bills of inclosure in the late reigns, before which the whole number was only two hundred and forty-four, is a proof how much more rapidly the cultivation of new land has proceeded than formerly; and the garden-like appearance of the country, as well as the striking improvement in the condition of all classes of the rural population, display, in the most decided manner, the skill and the success with which this great branch of national industry is now followed throughout the greater part of Britain.

In a view of the progress of husbandry, any considerable improvements in the species of crops cultivated, and the order in which they succeed one another, in agricultural machinery, and in the kinds and varieties of live stock, are entitled to hold a very prominent place. The great line of distinction between the present and the former courses of cropping consists in the alteration of what are called exhausting and ameliorating crops. The best cultivators rarely take two corn crops in succession; but corn is almost universally succeeded by a leguminous crop, or one of herbage, cut or pastured, or turnips, cabbages, rape, &c., or when the soil is not suited to turnips, by a summer fallow, recurring at as distant an interval as its condition will permit. In common language, a green or a pulse crop, or a plain fallow, is interposed between every two white

corn crops. These green crops not only preserve the fertility of the soil, but when sown in rows as most of them usually are, they afford an opportunity of extirpating weeds, by the use of the horse and hand-hoe; and even when sown broadcast, by their taking complete possession of the ground, if it is properly prepared, the growth of weeds is effectually checked. In other respects, these intermediate crops are of the utmost importance in every good course of management. Whether they be eaten on the ground or carried to the farm-houses and straw-yards, much valuable manure is obtained from the consumption; and on sandy or gravelly soils, when only a part of the turnip-crop is eaten by sheep on the ground, the greatest defect of such land is removed by their treading, and in many cases it is rendered capable of producing as valuable a crop of wheat as soils of a closer texture. It is for these reasons that, by the cultivation of clover, and turnips in particular, in regular alternation with corn, the soil is so much enriched as to yield as much corn on the half of any given extent of land, as the whole did under the old course of successive crops of corn; and, unless upon strong clays, an unproductive fallow is wholly dispensed with.

But these crops are not less valuable in another point of view. Before the introduction of clover and turnips, there was nothing for the maintenance of live stock but natural herbage in summer, with the addition of hay and straw in winter; and in the northern parts of the island in particular, where the winters are long and severe, it was seldom possible to do more, for about half the year, than preserve cattle and sheep from starving. Even in the most favorable situation, very little butcher-meat could be brought to market from December to June, unless at an expense which the great body of consumers were quite unable to re-imburse. The more early maturity of cattle and sheep, and the regular supply of the market throughout the year, are therefore, chiefly owing to turnips and clover, as well as the vast increase in the number of live stock kept on arable land, and the great degree of perfection to which some breeds have been brought by the skilful experiments of several eminent agriculturists.

Amongst these, the first place is unquestionably due to Mr. Robert Bakewell, of Dishley, in Leicestershire. By his skilful selection at first, and constant care afterwards, to breed from the best animals, he at last obtained a variety of sheep, which for early maturity, and the property of returning a great produce of mutton for the food they consume, as well as for the small proportion which the weight of the offal bears to that of the four quarters, are altogether unequalled either in this or any other country. The Dishley, or new Leicester sheep, and their crosses, are now spread over the principal corn districts of Britain; and from their quiet domesticated habits, are probably still the most profitable of all the varieties of sheep, on farms where the rearing and fattening of live stock are combined with the best courses of tillage crops.

The practice of Mr. Bakewell and his followers, furnishes an instance of the benefits of the division of labour, in a department of business where it was little to be expected. Their males were let out every year to breeders from all parts of England; and thus, by judiciously crossing the old races, all the valuable properties of the Dishley variety descended, after three or four generations, to their posterity. By no other means, could this new breed have spread so rapidly, or been made to accommodate itself so easily to a change of climate and pasture. Another recommendation of this plan was, that the ram-hirer had a choice among a number of males of somewhat different properties, and in a more or less advanced stage of improvement, from which it was his business to select such as suited his particular object. These were reared by experienced men, who gave their principal attention to this branch alone; and having the best females as well as males, they were able to furnish the necessary supply of young males in the greatest variety, to those farmers whose time was occupied with other pursuits. The prices at which Mr. Bakewell's rams were hired appears enormous. In 1789, he received twelve hundred guineas for the hire of three brought at one birth; two thousand for seven; and for his whole letting, at least three thousand guineas.

Merino sheep were first brought into England, in 1788, when his late Majesty, George III. procured a small flock by way of Portugal. In 1791, another flock was imported from Spain. In 1804, when the annual sales commenced, this race began to attract much notice. Dr. Parry, of Bath, crossed the Ryeland or Herefordshire sheep with the Merinos, and brought the wool of the fourth generation to a degree of fineness not excelled, it is said, by that of the pure Merino itself; whilst the carcass, in which the great defect of the Merino's consists, has been much improved. Lord Somerville and many other gentlemen have bestowed much attention on this valuable race, which, however, has not spread itself over the country; and the wool is understood to have deteriorated.

One of the most valuable plants introduced into cultivation since 1760, is the *ruta бага*, or *Swedish turnip*, which, in a great degree, supplies the great *desideratum* of late spring food for live stock, after the common turnip is generally much damaged, and sometimes almost wholly destroyed, by the severity and changes of the weather. The *Scottish yellow turnip* is, for the same reason, a most useful variety, coming in between the white turnip and the Swedish, in some situations supplying the place of the latter, and yielding generally a larger produce. A new variety of oats, called the *potato oat*, was accidentally discovered in 1788. It comes early, and gives a large produce both in grain and in meal, on good soils; and was soon cultivated over all the north of England and South of Scotland. But it has already begun to degenerate. A good many varieties of summer wheat have been introduced of late, but they are only partially cultivated.

Under the head of Agricultural Machinery, we need only notice the improvement of the *swing-plough*, by Small, and of the *threshing machine*, by Meikle, though the latter may rather claim the entire merit of the invention.

Little further alteration in the rural economy of England occurred till the establishment of the National Board of Agriculture, when a general desire seized all ranks to promote internal improvements. Hartlib, a century and a half before, and Lord Kames, in his

Gentleman Farmer, had pointed out the utility of such an establishment; but it was left to Sir John Sinclair to carry their ideas into execution.

About the year 1790, Sir John Sinclair, a gentleman of genuine patriotic philanthropy, conceived the idea that such a Board, properly constituted, would be of vast importance to the agricultural interests of the kingdom. Having, with much attention to the subject, matured his plan, and communicating the same to some of his parliamentary friends, in May, 1793, "An address from the honourable House of Commons was presented to his Majesty, entreating that his Majesty would be graciously pleased to take into his royal consideration, the advantages which might be derived by the public from the establishment of a board of agriculture and internal improvement."

After surmounting the difficulties naturally attending the formation of such an institution, the charter for the same was drawn up, and sanctioned by the authority of the great seal, in August of the same year, and the founder elected president. To this society we are indebted for eighty volumes of the most useful agricultural knowledge, which could be procured from literary men, resident in, or intimately acquainted with the respective counties, under the title of a *General View of the Agriculture thereof, with Observations on the Means of Internal Improvement*. The grand outlines of the plan of these views are, the geographical state of each county, the state of property, farm buildings, mode of occupation, implements, fences, arable land, grass, orchards, plantations, draining, and other improvements, live stock, rural economy, means of improvement, &c.

A work, comprising so many important objects in the science of agriculture, cannot fail of producing national benefits, greater, perhaps, than have been derived from any other political institution of modern times.

Besides the county reports of agricultural views, the board have published sundry volumes of communications on various topics of husbandry, which have been transmitted to them by writers fully conversant with the subjects of their respective communications. By pursuing such plan for a few

years, and publishing to the world such communications, under some systematic arrangement, we may expect that agriculture will become the best understood, and the most accessible of any art in the whole circle of human acquirement.]

Two advantages, among many, may be mentioned of the benefits of such an establishment:—*First*, A great number of new men were brought forward by the Board, whose names otherwise would probably never have been heard of; and these being chiefly practical people, who were professionally concerned in farm-management. Agriculture, by their endeavours, was rescued from the hands of *Theorists*, and a revolution of no small extent accomplished in rural affairs:—*Secondly*, Before the Board was instituted, the bond of connection amongst agriculturists was slender, and served few useful purposes. Each trusted to his own information, and knew little more about the practices of contiguous districts, than those of China or the most distant countries. The establishment of the Board removed all these evils and difficulties. A common fortress, erected for the benefit of all agriculturists, and to which each might resort for advice and protection, was immediately recognised. It made farmers, who resided in the most distant quarters of the kingdom, acquainted with one another; and caused a rapid dissemination of knowledge amongst the whole profession. The art of agriculture was brought into fashion; old practices were amended; new ones introduced, and a degree of exertion manifested, which had never before been exemplified in this country.

But the numerous agricultural surveys, executed under the authority of the Board, were of singular advantage also, because they brought to light the practice of every county; and while they pointed out the obstacles which lay in the way of improvement, they stated the most effectual methods of removing them. The very collision of argument which such discussions occasioned, incited agriculturists to investigate the principles of the art which they professed, and induced them to search after new channels of improvements.

That the first measure adopted by the Board, namely, a general survey of

the island, was a useful one, has been acknowledged by every person; but doubts have been entertained by many, concerning the utility of several subsequent measures, which deserves some consideration. It has been urged, and with some degree of justice, that the endeavours of a public Board should be limited to such objects as exceed the powers of an individual to accomplish; and that a Board, composed of materials like the present one, ought not to interfere with the *minutiæ* or practice of farming; but leave these matters entirely to the management or direction of persons by whom the art is exercised. Under these impressions, it has been stated, that the Board were discharging their duties, when they recommended to Parliament a division of common, or waste land; and in like manner, that their efforts would constantly be of advantage, when directed to a removal of obstructions to improvement, which required legislative interference. A recommendation from a public Board carries weight along with it, ensuring a degree of success not to be obtained by the petition or complaint of one or two individuals. Hence the propriety of originating, at the *Board of Agriculture*, all laws and regulations influencing or operating upon rural economy, because the members of the Board may reasonably be supposed to possess a degree of knowledge in rural science, rendering them sufficiently qualified to judge of, and determine upon, the measures to be adopted.

But, on the other hand, it has been urged, that the practice of husbandry ought not to be included in their deliberations; and that every thing of that kind may safely be left to professional people, who are morally and physically better qualified to investigate and ascertain what is right to be executed. It has been further urged, that when a *Board of Trade* acted in this country, its measures were confined to the great and leading objects of commerce, without descending to *minutiæ*, or interfering with the business of individuals. In short, it has been supposed almost as preposterous for the *Board of Agriculture* to meddle with ploughing, sowing, planting potatoes, building cottages, &c. &c. as it would have been for the *Board of Trade* to issue directions to apprentices concerning the

best way of folding or tying parcels. Though inclined to think there is some weight in the arguments urged, we adhere to the opinion already given, that much good has been done by the Board, and that a great deal more may be accomplished. The scantiness of their funds, however, is a reproach to the nation, and calls loudly for additional aid to such a meritorious establishment. If the generous spirit which animated the Persian kings had pervaded our rulers, when the Board was established, or even had the latter estimated agriculture as of the same value as it was appreciated by the former, a complaint of this kind would have been superfluous. At the annual festival in April in each year, in honour of agriculture, it was usual for the Persian king to address the farmers to the following effect: "I am one of you. My subsistence, and that of my people, rests on the labours of your hands; the succession of the race of man depends on the plough, and without you we cannot exist. But your dependence upon me is reciprocal. We ought, therefore, to be brothers, and live in perpetual harmony."

A great many excellent works on agriculture, and relative subjects, have been published since 1760; and among these, several periodical miscellanies have been favourably received, and widely circulated. But as they are comparatively recent, and the best of them well known, it is unnecessary to give any particular account either of their merits or defects.

It is a fortunate circumstance that this art, so essential in itself, and the foundation (as it were) of all other arts, is in every respect conducive to the welfare of those engaged in its labours. It is most healthy as regards the body, and to the mind it also bestows a considerable degree of reflection to the lowest persons engaged in it, and at the same time prevents them from acquiring that degree of artifice and cunning which is apt to mingle in the character of those engaged in the inferior branches of commercial employment. Nor does it fail to produce in all ranks and conditions of men, a more candid and liberal character than any other employment.

Yet, notwithstanding all these partial and numerous encouragements, it is an undeniable fact, that the present im-

proved state of our agriculture is not capable of furnishing a supply of corn equal to the average consumption of the population of the country, whereby the balance of this important article of commerce is always against us; and we are thus dependent upon foreign markets for a sufficiency of various kinds of grain, and more particularly of wheat, to provide with certainty for our annual consumption, and to guard, not merely against a scarcity, but the horrors of a famine. The former of these evils was severely felt during the years 1799 and 1800, when we were saved from a total deprivation of bread, only by a foreign supply. It would, therefore, surely be an object worthy of the most serious attention of the legislature, to adopt some efficient remedy against a recurrence of this, so formidable an evil. And when we consider the immense tracks of *crown lands* dispersed throughout the kingdom, many of which are literally producing nothing but "thorns and thistles," yet capable of the highest state of cultivation, we cannot but lament that so much of the richest natural soil of this happy island should be suffered thus to lie waste and barren, which would by the industry of the farmer, produce a sufficiency of bread for so many thousand persons, should, *in times like the present*, be altogether lost to the community at large.

It is only as far as agriculture flourishes in any nation, that it has flourished or can be permanently prosperous. Every improvement is a moral benefit conferred on mankind; for by increasing the quantity of human food, or facilitating its production, the strength of a nation is increased in proportion as its soil is skillfully cultivated, and the independence of its inhabitants is secured, when they find on the spot all that is necessary for their comfortable subsistence.

ON THE THEORY AND PRACTICE OF AGRICULTURE.

In an art so necessary to mankind, and one that has been so universally practised, it may perhaps be expected that the principles on which its operations depend, have by this time become completely and accurately investigated, and that consequently a correct theory may be exhibited. This, however, is by no means the case; and

it is not a little singular, that in this most useful of all arts, the theory should be more defective than in almost any other with which we are at all acquainted. It is fortunate, however, for the human race, that in most cases, or at least in all important arts, they succeed better in practice than in speculation. Various reasons render it more difficult to form a complete theory of agriculture, than of chemistry, mechanics, or other arts. In agriculture, an experiment cannot be made in an instant, an hour, or a day. A whole season must pass away before a single experiment can be performed, and even then the inquirer may be misled (as in other arts) by some unobserved circumstance. Some fact, quite foreign to the experiment itself, arising out of the peculiar state of the soil, or of the train of seasons, may produce plentiful crops for a year or two, although in ordinary circumstances, no such effect would follow, and the ingenious contriver of the experiment, who thought he had made an important discovery, may afterwards derive from it only disappointment and mortification. Human life itself is too short for the same individual to perform any great variety of experiments in agriculture. After a few seasons he leaves his place to be occupied by a new inquirer, possessed of a different character and of different views. Until of late years, it was not usual for husbandmen to publish the results of their private experience. Scattered over the face of large countries and having little intercourse with foreigners, or even with each other, they knew but little as to what was done or doing by men engaged in the same profession even at no great distance. The benefit of local discoveries therefore was not communicated to the world at large, nor was an opportunity afforded to correct local prejudices and erroneous practices. But as the state of this important profession is now rapidly altering in these respects, there is little doubt that we are fast approaching towards a period at which it will be possible to exhibit a clear and correct theory of agriculture, or to arrange, under a few simple heads, the rules or principles upon which the practice of the art depends.

An attempt of this kind will naturally resolve itself into the two following

investigations: *first*, to inquire among the great variety of vegetables that exist in nature, what particular plants ought to be regarded as most worthy of cultivation; and *secondly*, to consider the best mode of cultivating with success the plants thus selected. With regard to the first of these divisions, namely, what vegetables ought to be chosen as most valuable and worthy of cultivation; it may be observed, that the value of a plant is of two kinds, *absolute* and *relative*. The *absolute* value of a plant depends upon its fitness to afford subsistence to the human species—its *relative* value consists in the tendency of its cultivation to enrich a particular husbandman, or class of husbandmen, either because their lands are well adapted for its growth, or because there is a ready market, and consequently a high price for it in the vicinity.

Concerning the *absolute* value of plants, or their tendency to afford subsistence to mankind, it is to be observed, that some plants are *directly* useful or valuable, because they are consumed by man in the way of food, such as wheat, oats, barley, potatoes, &c.; whereas, another class is only useful in an *indirect* manner, by giving them to cattle and afterwards eating the flesh of those cattle, as is the case with grass and straw of all kinds.

Some vegetables afford us subsistence by means of the fruit that grows upon them, which hangs, and is brought to maturity in the air, at the summit of their stems. Others derive their value from their producing roots, which come to maturity in the bosom of the soil, and are dug from thence to be consumed by mankind. Of fruit-bearing vegetables, those called trees, which rise aloft with a stout trunk, are the most permanent and remarkable. A spot of ground occupied by some kinds of trees, such as chesnuts and dates, is capable of producing a very large portion of food for the support of man. One advantage in cultivating such trees would be, that after they had been planted and secured for a few years by fences, they would, for a number of years afterwards, continue to grow and flourish without any further care or labour. It does not, however, appear, in any nation, either ancient or modern, that forests of fruit-bearing

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ing trees have been reared with this view. For this, two reasons may be assigned. In the *first* place, a considerable number of years must elapse before they could arrive at maturity; and, *secondly*, because they would be destroyed in a time of war. However useful, therefore, they might be to future ages, it is evident they could afford but little prospect of advantage to the generation which planted them.

Of annual plants cultivated for fruit, WHEAT has always been accounted the most valuable. This has probably arisen from the great facility with which the flour of it undergoes a process of fermentation, which renders it capable of becoming a more light and agreeable kind of bread than the flour of any other grain. This quality is believed to arise from a quantity of a substance, contained in wheat, that is of the same nature with the gluten, or glue, that is prepared from animal bodies. It may not be improper to remark here, that, in modern times, an author of no mean reputation, has arisen, who endeavours to prove that wheat ought not to be cultivated, nor bread to be eaten. This is M. Linguet, who has written a treatise expressly upon the subject; and, ridiculous as the assertion may seem, it has been thought worthy of a formal refutation by Dr. Tissot!!!

One of Mr. Linguet's arguments is, that wheat impoverishes the ground upon which it grows. Another objection is, the length of time required in the cultivation of wheat; but the most extraordinary argument, perhaps, ever thought of is, that the use of wheat, or bread made from it, is *detrimental to population*; and that the countries where this grain is cultivated, are poor and thinly inhabited, whereas those which abound in vineyards and pasture lands are rich and populous.

Dr. Tissot, in reply, argues that corn is more easily cultivated than grass; and that in districts which furnish fodder and fine crops of grain, the inhabitants are wealthy and happy, if not oppressed by taxes.

Notwithstanding its manifest utility as a necessary of life, and its importance to the farmer, as being the article from which rent in many districts is altogether paid, landed proprietors

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have, in numerous instances, attempted to interdict its culture; or, at least, they have studiously endeavoured to lessen the quantity cultivated, by restrictions or penalties upon the grower, if a certain stipulated quantity was exceeded in any one year; and more particularly, if that quantity was exceeded in the latter years of a lease. Whether proprietors acting in this way were moved by wise and useful reasons, needs no inquiry; because it is evident, that the greater the value of the produce raised upon a farm, so much more rent is the farmer enabled to pay the proprietor; and though this increased rent may be delayed for a few years, namely, to the end of the current lease, the proprietor is sure to obtain it at that period. Proprietors, however, have hitherto thought differently, and their errors have been sanctioned by the courts of law, who have not been slow in punishing farmers, considered by them as deviators from the rules of good husbandry. Notwithstanding the impediments in the way, both legal and conventional, the culture of wheat has of late prodigiously increased, and now constitutes a prominent branch of British husbandry. Landed proprietors, it is believed, are now almost satisfied, that the growth of this grain does not deteriorate or waste their lands, though formerly not a few of them thought that the vegetative powers of their estates might be sold in the public markets in the shape of wheat—an idea handed down from father to son for successive generations, though now in some degree renounced and abandoned.

ON SOILS GENERALLY.

A land considered as the basis of vegetation is called soil. The particles of the various solid, as well as less compact bodies, that are met with in nature, and which have been rubbed down and reduced by the successive operations of the atmosphere, and the agency of other natural causes, being mixed and blended together in different ways and proportions, constitute the earthy compounds, which, from their being capable of absorbing, and in some measure retaining, moisture, as well as giving stability, afford the means of support to various products of

the vegetable kind, and form the basis of soils in general; whilst the materials proceeding from the decomposition and decay of numerous organized animal and vegetable substances, uniting with such compounds, compose the superficial layers of rich mould, from which plants chiefly draw or derive their nourishment and support.

Soils being formed in this manner, it is evident they must vary much, both in the qualities and proportions of the ingredients of which they are composed. In one situation or district one sort of material is abundant, and consequently enters largely into the soil; in others it is deficient, while those of other kinds are plentiful, and constitute the principal parts of the soils where they are found. Some situations abound much more with animal and vegetable matters than others, which produce great diversity in regard to the soils. The harder and more firm substances of nature, being, on account of their structure, reduced more slowly, and with greater difficulty, into the state of earth, generally enter in much smaller proportion into the composition of soils, than those which are of a soft and pliable disposition, and which approach nearer to the quality of earth. Thus argillaceous, loamy, and vegetable matters are found to predominate very much in soils in their primitive state, and, according to their particular qualities and proportions, to constitute very material differences in their properties. Calcareous and siliceous earthy matters are distributed over some districts in great abundance, while in others they enter into the composition of the soils in much smaller proportions, and thus contribute to vary their texture and qualities.

One of the means of deciding in respect to soils, which, in many cases, when properly limited and exercised, by a person of sound judgment and duly experienced, is certainly not a bad one, though in some respects also defective; is that of determining from the nature of the plants that are naturally produced, the degrees of their growth and luxuriance. Thus, where plants, that are only accustomed to grow in good or peculiar sorts of soil, are met with in their natural and flou-

rishing states in other places, the soils may be concluded to be of this or that kind, according to the circumstances in which they are found, and decide, in the opinion of the farmer, their agricultural value with more popular certainty than even chemical analysis.

The *saintfoin* is almost always an indication of *calcareous soil*; the *Tussilago Farfara* (common coltsfoot) of *blue clay*; the *arenaria rubra*, of *poor sand*; the *small wood sorrel* of the presence of *iron*, or of *peat*. The *arundo phragmites* (common reed grass), and the *polygonum amphibium* (common pond weed), grow on *alluvial soils*, which yield excellent crops if properly drained; but where the *equisetum arvense* (field horse-tail), grows freely, it is a sure indication of a *cold and retentive subsoil*. The *anagallis arvensis* (field pimpernell), *sherardia arvensis* (field madder), *lithospermum arvense* (corn groomwell), and the *fedia olitorea* (lamb's lettuce), grow in cultivated *black loamy soil*, on a dry bottom. Soil of this description, when wet, produces the *stachys palustris* (clown's all-heal). A *light sandy soil* is known by the presence of the *lamium purpureum* (red dead nettle); and the *thalspi bursa pastoris*, where the *aphanes arvensis* (parsley piert), is found, the soil is rather unproductive; if the *spergula arvensis* (corn spurry), grows very thick, the ground has likely been rendered too fine by the harrow; the *senecio jacobæa* (common ragwort), and the *serratula arvensis* (corn thistle), grow indiscriminately on *light and strong loams*, but always indicate a *fertile soil*. The *draba muralis* (whitflow grass), and the *sceleranthus annuus* (common knawell), grow on soils that are *dry, sandy, and poor in the extreme*. The *ononis hircina* (common rest harrow), is often found on dry pastures, and where the soil is *incumbent on rotten rock*. The *saline, aquatic, and peaty soils* are almost every where indicated by their appropriate plants.

The growth of certain sorts of timber trees and hedges, may also in various instances serve to direct the judgment, and likewise the appearances or colours of the mould in particular instances; the smell and the touch will also help to inform us of the quality of a soil. The best emits a fresh pleasant scent, when fresh dug up; and if due proportions of

clay and sand are intimately blended, it will not stick much to the fingers in handling.

THE NOMENCLATURE OF AGRICULTURISTS; with regard to soils, being variable and indistinct, it is a difficult task to describe them, or to mark with any degree of accuracy, the shades which distinguish one from another, so nearly are many of them connected.

The amiable and indefatigable Mr. Loudon has ingeniously constructed the annexed *Table*, which enumerates the more common genera, species, and varieties of soils. The application of the terms will be understood by every cultivator, though to attempt to describe the soils, either chemically or empirically (as by sight, smell, or touch), would be an useless waste of time. From a very little experience in the field or garden, more may be gained in the study of soils, than from a volume of such descriptions. This *Table* corresponds with the nomenclature adopted in the agricultural establishment on the Continent, and it is therefore very desirable that it should become as generally adopted as that of the Linnæan system in botany. The principle of the *Table* may be extended so as to include any other soil whatever.

Mr. Loudon observes, "that in naming the species of soils, greater care is required to determine distinctions than in naming the genera; and there is also some difficulty in applying or devising proper terms. The species are always determined by the mixture of matters, and never by the colour or texture of that mixture which belongs to the nomenclature of varieties. Thus a clayey soil with sand is a sandy clay, this is the name of the species; if the mass is yellow, and it is thought worth while to notice that circumstance, then it is a yellow sandy clay, which expresses at once the genus, species, and variety. A soil containing equal parts of clay, lime, and sand, would, as a generic term, be called clay, lime, and sand; if it contained no other mixture in considerable quantity, the term entire, might be added as a specific distinction; and if notice were to be taken of its colour or degree of comminution, it might be termed a brown, a fine, a coarse, a stiff, or a free entire clay, lime, and sand."

CLASS.	ORDER.	GENUS.	SPECIES.	VARIETY.	SUB-VARIETY.
Primitive soils . . .	Earths alone . . .	Clay . .	Entire . . .	Black . . .	Moist. Dry. Rich. Poor. Sterile.
				Red . . .	Moist, dry, &c.
		Lime . .	Entire . . .	Yellow . . .	Moist, dry, &c.
			Sand . . .	Coarse . . .	Moist, dry, &c.
	Earths and salts or metals . . .	Clay . .	Ferrugineous . . .	Fine . . .	Moist, dry, &c.
			Cupreous . . .	Black, red, yellow, coarse, fine, &c.	Moist, &c.
			Saline . . .	Black, red, yellow, coarse, fine, &c.	Moist.
				Black, red, &c.	Moist.
		Lime . .	Ferrugineous . . .	Black, red . . .	Moist.
			Cupreous . . .	Black . . .	Moist.
			Saline . . .	Black, red, yellow, coarse, fine, &c.	Moist.
			Ferrugineous . . .	Black, red, yellow, coarse . . .	Moist, dry, rich.
		Sand . .	Cupreous . . .	Black . . .	Moist.
			Saline . . .	Black . . .	Moist.
			Loamy . . .	Black, red, yellow, &c.	Moist, dry, &c.
			Peaty . . .	Black, red, yellow, &c.	Moist, dry, &c.
		Clay . .	Mouldy . . .	Black . . .	Moist.
			Limy . . .	Black . . .	Moist.
			Sandy . . .	Black . . .	Moist.
			Clayey . . .	Black, red, yellow, &c.	Moist.
		Lime . .	Loamy . . .	Black . . .	Moist, dry.
			Sandy . . .	Black . . .	Moist.
			Peaty . . .	Black . . .	Moist.
			Mouldy . . .	Black . . .	Moist.
Secondary soils . . .	Earths and organic remains alone . . .	Clay . .	Clayey . . .	Black . . .	Moist.
			Loamy . . .	Black . . .	Moist.
			Sandy . . .	Black . . .	Moist.
			Peaty . . .	Black . . .	Moist.
			Mouldy . . .	Black . . .	Moist.
			Ferrugineous, loamy, &c.	Black . . .	Moist.
			Ferrugineous, limy, &c.	Black . . .	Moist.
			Ferrugineous, sandy, &c.	Black . . .	Moist.
		Lime . .	Ferrugineous, peaty, &c.	Black . . .	Moist.
			Ferrugineous, mouldy, &c.	Black . . .	Moist.
			Cupreous, loamy, &c.	Black . . .	Moist.
			Saline, loamy, &c.	Black . . .	Moist.
			Cineros, loamy &c.	Black . . .	Moist.
			Ferrugineous, loamy, &c.	Black . . .	Moist.
			Ferrugineous, sandy, &c.	Black . . .	Moist.
			Cupreous, loamy, &c.	Black . . .	Moist.
			Cupreous, sandy, &c.	Black . . .	Moist.
		Sand . .	Saline, loamy, &c.	Black . . .	Moist.
			Saline, sandy, &c.	Black . . .	Moist.
			Cineros, loamy, &c.	Black . . .	Moist.
			Cineros, limy, &c.	Black . . .	Moist.
			Ferrugineous, loamy, &c.	Black . . .	Moist.
			Ferrugineous, limy, &c.	Black . . .	Moist.
			Cupreous, loamy, &c.	Black . . .	Moist.
			Cupreous, limy, &c.	Black . . .	Moist.
	Earths and organic remains, with metals, salts, and rocks . . .	Granite . .	Saline, loamy, &c.	Black . . .	Moist.
			Cineros, limy, &c.	Black . . .	Moist.
			Ferrugineous, &c.	Black, red, yellow, &c.	Moist, dry, &c.
			Quartzose, &c.	Black . . .	Moist.
		Basalt . .	Ferrugineous, &c.	Black, red, yellow, &c.	Moist, dry, &c.
			Columnar . . .	Black . . .	Moist.
			Whitstone, &c.	Black . . .	Moist.
			Ferrugineous, &c.	Black, red, yellow, &c.	Moist, dry, &c.
		Schist . .	Micaceous, &c.	Black . . .	Moist.
			Chlorite, &c.	Black . . .	Moist.
			Ferrugineous, &c.	Black, &c.	Moist, &c.
			Calcareous, &c.	Black . . .	Moist.
		Sand-stone . .	Argillaceous, &c.	Black . . .	Moist.
			Cupreous, &c.	Black . . .	Moist.
			Chalky, &c.	Black, red, &c.	Moist, dry, &c.
			Marble, &c.	Black . . .	Moist.
		Lime-stone . .	Shelly, &c.	Black . . .	Moist.
			Magnesian, &c.	Black . . .	Moist.
			Sulphuric, &c.	Black . . .	Moist.
			Ferrugineous, &c.	Black . . .	Moist.
		Coal . .	Cupreous, &c.	Black . . .	Moist.
			Argillaceous, &c.	Black . . .	Moist.
			Siliceous, &c.	Black . . .	Moist.
			Slaty, &c.	Black, red, yellow, &c.	Moist, dry, rich.
			Pyritic, &c.	Black . . .	Moist.
			Stony, &c.	Black . . .	Moist.
			Woody, &c.	Black . . .	Moist.

Sir Humphrey Davy, however, in his *Elements of Agricultural Chemistry*, considers it as a vain labour, to attempt to class soils with scientific accuracy. He thinks, too, that the distinctions at present adopted by farmers are quite sufficient for the purposes of agriculture, especially if some degree of precision be had recourse to in the application of the terms. The term sandy, he thus conceives, should never be applied to any soil that does not contain at least seven-eighths of sand; sandy soils, that effervesce with acids, should be distinguished by the name of calcareous sandy soil, to distinguish them from those that are siliceous. The term clayey soil should not be made use of to any land which contains less than one-sixth of impalpable earthy matter, not considerably effervescing with acids: the word loam should be limited to soils containing at least one-third of impalpable earthy matter, copiously effervescing with acids. A soil to be considered as peaty, should contain at least one-half of vegetable earthy matter. And that, in cases when the earthy part of a soil obviously consists of the decomposed matter of one particular sort of rock—a name derived from the rock, may with propriety, it is supposed, be given to it. In this way, it is imagined, that if a fine red earth be found immediately above decomposing basalt, it may be denominated basaltic soil. If fragments of quartz and mica be found abundant in the materials of the soil, as is often the case, it may be called granitic soil, and the same thing may be done in a great number of other similar cases.

In general, the soils, the materials of which are the most various and heterogeneous, are those called alluvial, or which have been formed from the depositions of rivers; and these deposits may be designated as siliceous, calcareous, or argillaceous; and in some cases the term saline may be added as a specific distinction, applicable, for example, at the embouchure of rivers, where their alluvial remains are overflowed by the sea.

A CONDENSED VIEW OF THE CHEMISTRY OF SOILS, AS GIVEN BY SIR H. DAVY.

"In cases," says this writer, "where a barren soil is examined, with a view to its improvement, it ought in all cases,

if possible, to be compared with an extremely fertile soil in the same neighbourhood, and in a similar situation; the difference given by their analyses would indicate the method of cultivation, and thus the plan of improvement would be founded upon accurate scientific principles.

"If the fertile soil contained a large quantity of sand, in proportion to the barren soil, the process of melioration would depend simply upon a supply of this substance, and the method would be equally simple with regard to soils deficient in clay or calcareous matter. In the application of clay, sand, loam, marl, or chalk to lands, there are no particular chemical principles to be observed; but, when quick-lime is used, great care must be taken that it is not obtained from the magnesian limestone, for in this case it is exceedingly injurious to land. The magnesian limestone may be distinguished from the common limestone by its greater hardness, and by the length of time that it requires for its solution in acids; and it may be analysed by the process for carbonate of lime and magnesia.

"When the analytical comparison indicates an excess of vegetable matter as the cause of sterility, it may be destroyed by much pulverization, and exposure to air, by pairing and burning, or the agency of lately made quick-lime; and the defect of animal and vegetable matter must be supplied by animal or vegetable manure. The general indication of fertility and barrenness, as found by chemical experiments, must necessarily differ in different climates, and under different circumstances. The power of soils to absorb moisture, a principle essential to their productiveness, ought to be much greater in warm and dry countries, than in cold and moist ones; and the quantity of fine aluminous earth they contain, should be larger. Soils likewise that are situate on declivities ought to be more absorbent than those in the same climate on plains or in valleys.

"The productiveness of soils must likewise be influenced by the nature of the subsoil, or the earthy or stony strata on which they rest; and this circumstance ought to be particularly attended to, in considering their chemical nature, and the system of improvement.

Thus, a sandy soil may owe its fertility, to the power of the subsoil to retain water; and an absorbent clayey soil may occasionally be prevented from being barren, in a moist climate, by the influence of a sub-stratum of sand or gravel. Those soils that are most productive of corn, contain always certain proportions of aluminous or calcareous earth, in a finely divided state, and a certain quantity of vegetable or animal matter.

"The quantity of calcareous earth is, however, very various, and in some cases exceedingly small. A very fertile corn soil from Ormiston, in East Lothian, afforded in one hundred parts, only eleven parts of mild calcareous earth; the finely divided clay amounted to forty parts. It lost nine in decomposed animal and vegetable matter, and four in water, and exhibited indications of a small quantity of phosphate of lime. This soil was of a very fine texture, and contained very few stones or vegetable fibres. It is not unlikely that its fertility was in some measure connected with the phosphate, for this substance is found in wheat, oats, and barley, and may be a part of their foods.

"A soil from the low lands of Somersetshire, celebrated for producing excellent crops of wheat and beans without manure, I found to consist of one ninth of sand, chiefly siliceous, and eight-ninths of calcareous marl, tinged with iron, and containing about five parts in one hundred and ten of vegetable matter. I could not detect in it any phosphate or sulphate of lime, so that its fertility must have depended principally upon its power of attracting principles of vegetable nourishment from water and the atmosphere.

"Mr. Tillett, in some experiments made on the composition of soils at Paris, found that a soil composed of three-eighths of clay, two-eighths of river sand, and three-eighths of the parings of limestone, was very proper for wheat. In general, bulbous roots require a soil more sandy, and less absorbent than the grasses. A very good potato soil from Varsel, in Cornwall, afforded seven-eighths of siliceous sand, and its absorbent power was so small, that one hundred parts lost only two by drying at four hundred degrees, Fahrenheit. Plants and trees, the roots of which are fibrous and hard, and capable of penetrating deep into the earth, will vege-

tate to advantage in almost all common soils that are moderately dry, and do not contain a very great excess of vegetable matter.

"The soil taken from a field at Sheffield Place, in Sussex, remarkable for producing flourishing oaks, was found to consist of six parts of sand and one part of clay, and finely divided matter; and one hundred parts of the entire soil, submitted to analysis, produced water three, siliceous fifty-four, alumina twenty-eight, carbonate of lime three, oxide of iron five, decomposing vegetable matter four, loss three."

QUALITY OF SOIL EVINCED BY CHEMICAL ANALYSIS.—The discovery of the qualities of soils by chemical analysis, is extremely difficult, and is seldom performed successfully by the cultivator. In selecting specimens, care should be taken to procure them from different situations. When the field is in one part calcareous, and in another siliceous, the portions should be separately submitted to the experiments. From two to four hundred grains is the proper quantity for a perfect analysis, which should be rolled in fair weather, and when perfectly dry, preserved in phials, closed with ground glass stoppers, till the period of examination. The soil best for culture, according to the analysis of Bergman, contains four parts of clay, three of sand, two of calcareous earth, and one of magnesia. Kirwain observes, that the fertility of the soil depends much upon its capacity for retaining water. The ingredients of the soil, however, do not always correspond to the nature of the climate; the quantity of rain that fertilizes a wet soil cannot be equally suited to a dry one. Silicia in the soil exists under the modification of sand—alumina under that of clay. Soils in which the sand preponderates, are called dry, retaining the least moisture; those in which clay preponderates, retaining the greatest portion, are called wet. Before either of them are capable of culture, the excess must be retrenched, or the defect supplied. Besides the above, properties of soil may be ascertained mechanically. Its specific gravity may be ascertained by introducing into a phial, known to contain a certain weight of water, equal portions of water and of soil; to do which, it is necessary to pour in the water first, till the vessel is half full, and

then put in earth till it reaches the brim. The difference between the weight of soil and water will be the result. Thus, if a bottle which holds four hundred grains of water, gains two hundred grains when half filled with water, and half with soil, the specific gravity of the soil is two, that is, it will be twice as heavy as water. Clay, in any soil, may be known by its tenacity; sand by its roughness. Calcareous matter in soil, is known by its effervescing freely upon meeting with an acid. The presence of organized matter in soil may be ascertained by weighing it when it is perfectly dry; and after having subjected it to a red heat, weighing it again, which will give the proportion of organic matter. Metallic oxides in soil may in general be known by their colour. Ferruginous soils are red and yellow; cupreous soils are interspersed with greenish streaks; salt, coals, sulphur, &c., may be known by the appearance of the water in such soils, and also by the peculiarity of vegetation.

But, however, that our readers may be informed of some of the leading principles which chemistry employs, in analysing soils, we give him the following, which may be depended on.

1. *To ascertain the quantity of water in any soil.*—Take a pound of the soil, spread it very thin before the fire, or in the sun-shine in a warm day, let it lie till it is thoroughly dry: the evaporation of the water will be known by the weight lost.

2. *To know if there are any metallic or earthy salts.*—Take a pound of soil, pour upon it a pound of boiling distilled water, stir them thoroughly together, and let them stand for ten minutes, filter off the water through filtering paper, pour into what comes through, a solution of the fixed vegetable alkali; if there is any earthy or metallic salt, a precipitation will take place.

3. *To know if the salt contained has calcareous earths for one of its elements.*—Take the filtrated solution, pour into it half an ounce of caustic volatile alkali, or continue to drop in this alkali till no further precipitation takes place; afterwards filtrate it, and pour to what filtrates a little solution of fixed vegetable alkali; if there is any further precipitation, it shows that there is an earthy salt, consisting of calcareous earth for

one of its elements; if a precipitation took place upon the application of the caustic volatile alkali, it shows that there certainly are earthy or metallic salts.

4. *To know if the salt contained is metallic or aluminous.*—Add to the filtrated solution an infusion of gall; if there is any metallic or aluminous salt, a precipitation will take place; if iron, a purplish black; if copper or alum, a gray; copper may also be distinguished from iron by falling in a blue precipitate upon the application of an alkali, while iron forms a greenish, and alum a white one.

5. *To know if magnesia is an element of the salts found.*—Take the filtrated solution, apply to it a solution of galls; if no precipitation takes place, apply caustic volatile alkali, which will precipitate the magnesia if it is an element of the salt contained.

6. *To know if a neutral salt is contained.*—Evaporate the filtrated solution with a boiling heat, till the whole water is nearly gone off, and let it stand to cool; if there is any neutral salt, it will crystallize.

7. *To know if there is any mucilage, and what quantity.*—Take thirty or forty pounds of the soil, boil it in ten gallons of water for an hour, let the earth subside, pour off the clean solution, afterwards add four or five gallons of water to the earth, stir them thoroughly, let them stand to subside, pour off the water clear, mix it with the former, and evaporate the whole to dryness, putting it into a water-bath towards the end of the evaporation; what remains is the mucilage, making allowance for that part of the decoction which was not washed out from the earth, and deducting the same substances, which will crystallize if there is a considerable quantity, but will be destroyed in the operation, if in small proportion, as they generally are.

8. *To know if there is any calcareous earth in the soil, and what quantity.*—Take two ounces and a quarter of the dry soil, apply to it half an ounce of muriatic acid, and four ounces of water in a glass vessel sufficiently large; let them stand together till no more effervescence takes place; and if it was very considerable, pour in half an ounce more of the acid, let this stand also till the effervescence ceases, if any arises

upon pouring it in, continue to add more acid in the same manner, until what was poured in last produces little effervescence, which is often at the first, and generally at the second or third half ounce. After the effervescence has ceased, put the whole in a filter, let the solution filtrate through; pour half a pint of water upon what remains in the filter, let that filtrate also in the same vessel; add to the solution thus filtrated one ounce and a half of caustic volatile alkali for every ounce of acid used; if any precipitation takes place there is magnesia, earth of alum, or the calx of a metal (generally iron or copper) contained in the soil; after adding the volatile alkali, the whole is to be thrown into a filter again; after the filtration has taken place, pour into the liquor a solution of mild fixed vegetable alkali in water; if there is any calcareous earth in the soil, a precipitation will take place; continue to add the solution of the alkali till no fresh precipitation ensues, throw the whole into a filter, let the liquor filtrate off, pour on by degrees a pint of water, let that filtrate off also, dry what remains in the filter, it is the calcareous earth.

9. *To know the proportion of sand and clay.*—Take what remains in the filter after the first solution in the foregoing operation, and by the elutriation separate the sand from the clay, dry and weigh them; if there is any pyrites it will appear in the sand.

In the above processes, the principal things to be attended to are, whether there are any metallic or aluminous salts, as these are absolute poisons, and therefore are to be decomposed by quick lime; whether there is such a proportion of neutral or earthy as to be hurtful, in which case the solution in process 2, will taste salt, a soil containing them in so large a proportion will hardly ever admit of culture for grain; whether there is calcareous earth, and in what proportion, as that ascertains the propriety of applying any manure containing it, and the quantity of that manure; what the proportion of sand and clay is which ascertains the propriety of adding clay or sand; whether there are pyrites, as that shows why and when, a soil will be long in being brought into cultivation; pyrites are best destroyed by fallowing, and afterwards applying lime.

From the great difference of the causes that influence the productiveness of lands, it is obvious that in the present state of science, no certain system can be devised for their improvement, independent of experiment; but there are few cases in which the labour of analytical trials will not be amply repaid by the certainty with which they denote the best methods of melioration; and this will particularly happen when the defect of composition is found in the proportions of the primitive earth. In supplying animal or vegetable manure, a temporary food only is provided for plants, which is in all cases exhausted by means of a certain number of crops; but when a soil is rendered of the best possible constitution and texture, with regard to its earthy parts, its fertility may be considered as permanently established. It becomes capable of attracting a very large portion of vegetable nourishment from the atmosphere, and of producing its crops with comparatively little labour and expense.

THE SOILS OF THIS COUNTRY have been described under numerous heads, and distinguished by a variety of vague local terms. They seem, however, to be capable of being considered and characterised, as far at least as is necessary for practical purposes, under the distinctions of *clayey, loamy, calcareous, sandy, gravelly, peaty or mossy, and vegetable earth soils.*

Each of these divisions must of course comprehend several varieties, according to the nature and preponderancy of the different sorts of materials of which they are constituted or composed. By different combinations of these substances, all the intermediate kinds of soils are formed; and upon a proper mixture of them, in certain proportions, depends the success of the farmer's industry. *Sand, clay, and water,* are the grand component parts, whatever colour or texture the soil may happen to have.

CLAYEY OR ARGILLACEOUS SOILS.—Soils of this kind differ very materially, according to the nature and quantity of the clay that enters into their compositions, and the adulteration which has been produced in it by the intermixture of different earthy matters, as well as various mineral, vegetable, and animal substances. For clays are, in general, far from being pure in the state in

which they are found in the earth. They are in many instances united with large proportions of siliceous or sandy matter. On these accounts it is that the clayey soils of some districts are so abundantly fruitful and productive, while those of others are insuperably sterile and refractory.

These facts not only show that there is a prodigious variety in respect to the qualities of these substances, but that they must afford equal variety to the soils into which they enter, and therefore require to be more closely examined and more nicely ascertained than they appear yet to have been, before all the varieties of soil usually classed under the denomination of clayey, can be well ascertained and understood.

But these substances do not differ only in their properties and qualities, but likewise in their colours, and the closeness with which these particles are united. They are found in their natural states of various colours, such as red, white, blue, and yellow, and of different degrees of density, so as, in some instances, readily to admit of being united with the different materials that are applied, in order to meliorate their conditions; in others they can scarcely be made to join with them by any means in the power of the agriculturist. In soils of the first kind, the quantity of siliceous or sandy matter, in general, bears a much larger proportion to that of the argillaceous or clayey, than in those of the latter, and in many cases too the mixture of other substances is proportionably larger. The nature of the clayey stratum, in respect to its thickness or thinness, as well as its contiguity, or remoteness from springs of water underneath it, is too commonly overlooked in considering these sorts of soils; but all these circumstances demand particular attention, and ought to have considerable influence in directing the means of cultivating and improving clayey soils.

It is obvious, from what has been already advanced, that, notwithstanding the differences that take place from the accidental mixture of different materials, in different degrees and proportions, all the descriptions of this sort of soils must possess more or less of the heavy and adhesive stiff qualities; and that according as these are more or less

predominant (due respect being at the same time had to the various other circumstances that have been stated), the business of cultivation and improvement must be varied and applied.

LOAMY SOILS.—Loam denotes any soil which is moderately cohesive, that is, less so than clay, and more so than loose chalk. Soils, therefore, of this description, admit of considerable variety. The substances that are most commonly found to contribute to the formation of loamy soils, are clay, sand, gravel, and chalk; and as either ingredient predominates, so is the soil denominated, as clayey loam, sandy loam, &c. Clayey loam is moderately cohesive, in which the argillaceous ingredient predominates; so that its coherence is greater than that of any other loam, but less than that of pure clay. Besides the argil silex enters largely into the composition. Sometimes an oxide or calx of iron in small proportion is found blended with the clay and sand. In proportion as the argillaceous or clayey principle diminishes, they recede from the nature of the clayey soils; consequently the nearer the quantity of that substance approaches to that of the others, the stronger and more heavy will the loamy soil be. The differences in the lightness and friability of the soils of this class, in a great measure, depend on the relative proportions of the other ingredients. Where the calcareous ingredient greatly exceeds those of the sandy or gravelly kinds, they are neither so light nor so pulverizable as where they are nearly equal, or where the sandy or gravelly matters considerably predominate over it.

In situations where this sort of soil has been but little disturbed, and consequently little changed by the artificial additions of either animal or vegetable substances, and those which it naturally contained not having advanced to the stage of perfect solution and decay, it is generally found of a light brown or hazel colour; but where much culture has been employed for a length of time, and large applications of animal and vegetable matters frequently made, the natural and artificial materials of these kinds having proceeded more nearly to the state of perfect resolution and destruction, it has an appearance that approaches to black.

From these various circumstances the properties of the soils are likewise considerably altered and affected, as well as their colours changed.

From the soils of the loamy class being more friable and brittle, as well as more dry, than most of the clayey ones, they are capable of being tilled with much greater ease and facility, as well as much less strength of team, and at almost every season of the year; and, on account of their property of receiving and transmitting moisture more freely, they are less apt to be indurated by too much dry, or chilled by too much wet weather. Besides, they are more influenced on exposure to the agency of the atmosphere and other external causes, and thereby more adapted for the promotion and support of vegetation. And as they are found in most cases to be less disposed to the production of weeds, particularly those of the more injurious kinds, they can of course be kept clean with less labour, and without the expensive system of management which is requisite on many other kinds of soil.

CHALKY OR CALCAREOUS SOILS.—Soils of the calcareous kind, which are composed of clay, sand, and chalk, occupy very extensive tracts of land in different parts of the kingdom, and are marked with considerable diversity, as proceeding from the nature, properties, and proportions of the calcareous matter as it exists in them; the substances that are mixed and combined with the land; the depth and qualities of the earthy stratum which is placed upon it, and the disposition of the subsoil or basis on which this is formed and deposited.

Calcareous matter is contained in many different stony substances, besides that of chalk, as marble, limestone, coral, and shells of different kinds; and in states of union with other materials, such as sand, the different simple earthy bodies, in different proportions, and in some instances with iron and magnesia. Its capability or powers of imbibing and retaining moisture is considerable, though not so great as that of clay. It burns to lime by proper degrees of heat, and absorbs carbonic acid gas, or fixed air in different proportions from the atmosphere, and returns again to the state of chalk or mild calcareous matter. It is found of very different degrees of

hardness and friability, as well as of different states of fineness or pulverization, in different soils of the class to which it belongs. It varies also greatly in its effects in respect to vegetation; from the different matters that may happen to be combined with it in its primitive or original state. It has long been known to the practical agriculturist, that some sorts of lime may be employed in large proportions, while others cannot be used, except in very small quantities, without doing very considerable injury to the soil with which they are incorporated.

Calcareous matter, whether it is in the state of carbonate, or in the more active one of causticity, as quick-lime, seems ultimately to promote the resolution and destruction of vegetable and animal substances; in the latter state, however, it acts with much greater violence on these materials, destroying their organization, and dissipating their principles more quickly, as well as robbing them more completely of the carbonic acid gas, or fixed air, which is so essential, while, in the former, it operates with great mildness, and only aids the resolution of those substances by gently promoting the process of putrefaction.

The proportions of clayey, loamy, and gravelly ingredients, which are conjoined with the calcareous matters of these soils, are various in different districts; where the argillaceous and loamy materials are comparatively in large quantities, soils of the heavier chalky kinds are formed, and where the sandy or gravelly are predominant, we have the lighter ones. There are also material differences proceeding from the earthy matter with which the calcareous ingredient is mixed in the state of soil. Where the quantity of this is small, and not reduced into any very perfect state of mould, the soil, as it is evident, must be poor and thin; but where the depth of this superficial stratum is considerable, and the animal, vegetable, and other substances, of which it is composed, is advanced to a more complete stage of decomposition and decay, the soils are more rich and heavy. Some variety is likewise caused by the state of the under-stratum or subsoil. If it is compact, and much intermixed with siliceous or flinty matter, or have a mortary hardness, it is

less favourable than where it is of a more open, brittle, or powdery texture.

Whatever appearances of lightness there may be in chalky soils, they require considerable strength in the team, where the staple or earthy stratum of the lands will admit of their being wrought to a tolerable depth; but where there is a thinner surface of earthy materials, less force of draught will be requisite. In the latter cases, the soil is, however, far more precarious and uncertain, as well as much less productive in respect to the crops that are cultivated upon it, than in the former. As chalky soils are not so liable to be injured by water as others, the business of tillage is much less impeded from that cause; but a dry season sometimes renders them so hard as to be totally incapable of being broken up, until they have been moistened by the falling of a considerable quantity of rain.

SANDY OR SILICEOUS SOILS.—Sands seem to have been gradually formed by the attrition and rubbing down of the various solid substances that are found in nature, especially such as are of the siliceous, calcareous, and stony kinds, and are of different degrees of fineness as they approach the size of gravel. They are also met with of various colours and appearances, in different regions or tracts of country, such as white, dusky brown, yellow, and red. These differences, as well as those which respect their weight, tenacity, and other properties, depend on the nature and proportions in which many other materials enter into combination with them.

Where the proportions of clayey, loamy, or other earthy substances with which they are mixed, approach nearly to that of the sand, the heavier sorts of sandy soils are formed; but where these enter only in very small quantities, we have the light sandy soils; and where they are hardly met with at all, the soil is a loose blowing sand, most commonly of a white or brownish appearance. The portions of vegetable matter that are intermixed with different soils of the sandy kind are not less various than those of the clayey and loamy, from which considerable differences of quality are produced. These differences in their textures and compositions also introduce others which

respect their powers of admitting and retaining heat and moisture. The openness and want of adherence in such soils, while they allow of the admission of heat and water more readily, permit them to be carried off with greater ease and expedition; they are therefore less permanently benefited by their influence than the closer and more adhesive soils.

The light, open, and porous texture of sandy soils renders them much more easily cultivated and kept in order than those of the strong and close kinds; consequently the farms where they prevail are generally large; and when properly prepared, they are better adapted for the growth of many sorts of crops, such as those of the bulbous and tap-rooted sorts. They have also another advantage, which is that of pushing forward the crops with more expedition. Whatever inconveniences attend them, they are mostly such as proceed from the want of a sufficient degree of cohesion among their constituent particles and solidity of texture. On these accounts they often counteract the best and most judicious management. The roots of the crops are liable to become naked and exposed from storms and various other causes; and if grain, to fall down and be lodged so early in the season as to render them of little value.

GRAVELLY SOILS.—In the state of gravels which contribute to the formation of this class of soils, there is a variation of size in the pieces or particles of which they are composed, from that of a very small pea to the largest cockle. Where they become of still larger dimensions they are termed stones or rocks, according as they are in small portions or large masses; and the soils are then said to be stony or rocky, as the circumstance of the different cases may happen to be.

The beds of gravel, whether they are of the larger or smaller kinds, are mostly either of the siliceous or flinty kind, or of the calcareous or chalky; but the stones and rocks are of very different kinds. With these dissimilar substances, some others in different states of reduction and pulverization are blended and united in various proportions, so as to constitute gravelly soils that differ considerably in their textures and other properties. The chief of these are loams, and the mould

or earthy matter formed by the destruction and decay of numerous animal and vegetable substances.

The gravelly mixture is sometimes also found to approach nearly to the surface, while at other times it recedes considerably from it. In some instances springs rise immediately underneath; in others they are at a great depth. The bottom, or subsoil, is likewise various; in some cases it is stony and rocky, in others it is clayey, or a rocky gravel, and sometimes sand, &c.

The open porous nature of gravelly soils disposes them to admit moisture very readily, as well as to part with it with equal facility; from the latter of which circumstances they are subject to burn, as it is termed, in dry seasons, which is not the case in the heavier or more retentive sort of soils.

Gravelly soils, from the lightness of their texture, and their not affording great resistance, except where the stones are large, or there are rocks, are not expensive or difficult in the means of cultivation. All the necessary business of this sort is capable of being carried forward with much ease and expedition, and the lands are in general soon brought into the proper states for the reception of crops.

PEATY OR MOSSY SOILS.—These soils consist chiefly of the roots of decayed vegetables, mixed with earth, mostly argillaceous, and sand, and a coaly substance derived also from decayed vegetables. They differ, like all the other kinds of soils, according to the nature of the ingredients of which they are constituted or composed, and the proportions in which these are found to prevail in them. Where the vegetable or peaty material predominates but little over the other substances with which it is mixed and incorporated, the lighter sorts of peaty, moory, or heathy soils, are formed; but where the other matters bear only a slight proportion to it, the deep and heavy peaty or mossy soils present themselves. In different districts the peaty matter is found of different depths, and of various degrees of density or closeness of texture, probably proceeding from some original differences in the vegetable substances from which it was formed, or the greater advances which it has made to the state of perfect decomposition or decay. The subsoil in most

of the deep mossy districts is of the clayey kind, more or less stiff and heavy, over which the peaty or mossy material is deposited, generally in a sort of stratified order; the first layer of which being commonly not more than ten or twelve inches in thickness, exhibits the appearance of a rich brown earth, in all probability from the incorporation of the loamy or clayey matters, with the peat or vegetable earth lying immediately upon them, and constituting originally, perhaps, the surface of the ground. The layer that succeeds to this is mostly of a dark colour, and considerable thickness, apparently formed of a great variety of vegetable materials in the more perfect stages of resolution and decay, united together by time and other circumstances with more or less compactness and solidity. The uppermost stratum, or that which is placed upon this dense peaty matter, is, in general of very pale colour, and very light spongy texture, arising possibly from the grasses, leaves, and other vegetable substances, of which it is formed, not having attained that state of decay which constitutes the darker sorts of peaty earth.

But in the more superficial peaty soils, little or nothing of this stratified appearance is met with. A coat of peaty earth, differing greatly in thickness according to the peculiarity of the situations, and other circumstances, is formed by a great length of time from the destruction and decay of successive crops of grasses, leaves, and substances of the heathy or other kinds, and deposited upon, and intermixed with, the various harder materials of the soils which happened to be underneath them. By these means much variety is produced in the soils. Where the under-strata of earthy matter are tolerably good, and the crops of vegetables large and luxuriant, the better sorts of light peaty soils seem to be predominant; but where the quality of the under-strata are indifferent, and the vegetable products scanty, as well as feeble in their growth, and principally of the heathy tribe, the poor peaty and heathy, or moory soils, are met with.

All peaty soils seem to be thus gradually formed by the deposition of vegetable matter, supplied by the dissolution and decay of aquatic and other

plants that grow in low moist situations, as well as substances of other kinds brought down by water, from the high grounds in their neighbourhood, in the states of solution and diffusion, and gradually deposited from it on its becoming in a state of stagnation, by means of obstruction and stoppages proceeding from different causes.

From the nature of the composition of these soils, it is obvious that they must be very retentive of water, especially where they are of any great depth. Hence they seldom or ever become free from the excessive quantities of moisture, with which they are loaded in the rainy seasons.

VEGETABLE EARTH OR SOIL.—This kind of earthy material constitutes the superficial bed or stratum, in which plants for the most part vegetate in every sort of soil, and differs very much in different places, from the variations that take place in its depth, and the greater or less progress that has been made in the several substances of which it is composed, to the stage of perfect decomposition or decay.

Some variety may likewise be caused by its being more intimately or more loosely mixed and blended with the other bodies that are found in soils. It seems probable too, that the earthy matter which is formed from the destruction of some sorts of vegetable substances may be better suited for the purposes of vegetation than that which proceeds from others.

Vegetables, from their containing a considerable portion of mucilaginous matter in a state of mixture with their other substances, become, in some measure, capable of solution in water, though the external surfaces of living plants, on account of the resinous and animalized materials that enter into their composition, are protected from its operation. From the former circumstance, and that of earthy matters being contained in them, which had been taken up in the state of solution with their fresh juices while growing, it is evident that large quantities of vegetable mould must be continually formed and deposited on lands by the natural decay of such substances.

But the formation of vegetable mould or earth is further effected by means of the putrefaction or dissolution of such vegetables as are cut down, or other-

wise destroyed, on the surface of the ground, and the application of various kinds of dung and composts. Where these have been in great abundance for a long time, there is mostly a deep rich surface soil of this earth; but where few vegetable products, and those of the less luxuriant kind, have been left to undergo the above process, or little assistance given by means of manures, the crust of surface mould is generally thin and poor. The resolution of vegetable matters is generally promoted by a proper degree of moisture and heat, as well as by a suitable state of the air.

ALLUVIAL SOILS are of two sorts: one derived from the sediment of fresh, and the other of salt-water. Along the sides of rivers, and other considerable streams, water-formed soils are to be met with, consisting of the decomposed matter of decayed vegetables, with the sediment of streams. They are in general fertile and deep, and not apt to be injured by rains, as they usually lie on a bed of open gravel. They are commonly employed as meadows, from the hazard of crops of grain being injured, or carried off by floods, if cultivated.

Alluvial soils arising from the operations of salt-water, called salt-marshes, are composed of the finest parts of natural clay, washed off by running water, and deposited on flat ground, on the shores of estuaries, where they are formed by the reflux of the tide, and enriched with marine productions. They generally have a rich, level surface, and being deep in the staple, they are well adapted for the culture of the most valuable crops. Hence wheat, barley, oats, and clover, are all of them productive on this species of soil; which is also peculiarly well calculated for beans, as the tap-root pushes vigorously through it, and finds its nourishment at a great depth. From the great mass of excellent soil, the fertility of these tracts is nearly inexhaustible; but from their low and damp situations, they are not easily managed. Lime, in considerable quantities, is found to answer well upon this species of soil.

From the preceding account of soils we may perceive that those are the best which contain the greatest store of those principles which constitute the pabula of vegetation. Such are calca-

reous soils, in which carbon must exist in large quantities, from the natural attraction of lime from carbon, and where there will be a constant supply by means of this attraction. Soils formed from the decomposition of animal and vegetable matters, are in their natures eminently favourable to vegetation; for they contain hydrogen and carbon combined, together with the remains of animals and vegetables, as yet only tending to decomposition, with various salts resulting from the decomposition of animal bodies, water, earth, and gaseous principles.

USES OF SOIL.

Earths are of no further service to plants than providing them with a medium by which they fix themselves to the globe, and even the portions of earth taken up into them by vegetation, are not convertible to any other substance, and are supposed to afford the plant nothing but firmness of organization as wheat and oats, and many hollow stalked grasses, have an epidermis of earth to defend them from the attacks of insects and parasitical plants. Plants are nourished exclusively by means of water and decomposing organic matter. Earths, nevertheless, retain the water, and supply it to the roots; they also afford the means of distributing the proper nutriment; supply as they are wanted, those parts which are valuable, and prevent the too hasty decomposition. Notwithstanding soils are the genial aliment and support of plants, yet, from their numerous variety of roots, they require a corresponding variety of soil. Roots that are bulbous require a loose soil, such as are fibrous, one more solid, and those possessing those fibrous radicles, a soil considerably more compact and firm than those that have extensive lateral roots. Finely divided matters not only give tenacity and coherence to the soil, but greatly promote vegetation, a small quantity being sufficient to fit the soil for the production of barley or turnips. The latter have been produced upon a soil, eleven parts out of twelve of which have been sand, and the remainder of animal or vegetable matters.

Impalpable matters, however, must not be in too great a proportion. In order to promote the growth of vege-

tables, friability and a looseness of texture are requisite in the soil, so that the water, not lying in the soil in a state of aggregation, but being suspended in it, as water in a sponge, may have free access to the fibres of the wet, communicated by capillary attraction; and since alumina possesses the property of adhesiveness and silex, those of friability, in an eminent degree, it is evident that a due mixture of both is requisite to adapt the soil to the common purposes of cultivation. The absorbent power of soil by cohesive attraction, depends in some degree upon the division of its parts, and is highly necessary to fertility, because moisture absorbed from the atmosphere counteracts the effects of daily evaporation, and supplies the plant with moisture in the driest seasons. Stiff clays, which, like pipe-clays, take up the greatest quantity of water when poured upon them in a fluid form, are not the soils that in dry weather absorb the most from the atmosphere, because they cake and present only a surface containing the absorbent powers. To answer this purpose, a due mixture of sand, clay, carbonate of lime and organized matter, are necessary to give that looseness and tightness that shall render it permeable to the atmospheric air. Regard is however to be had to the site and climate in which the soil is situate; the nature and contiguity of the inferior strata, declivity of position, frequency of showery, moisture of climates, &c. exerting considerable influence.

The divisions of soils into cold and hot is extremely natural: some are more heated by the sun than others; and though equally heated, cool in different times. Clayey soils being clammy and moist, are heated with difficulty, and some cool chalks, are not easily heated, but retain the heat longer. The soils heated most by exterior causes, are perhaps black, containing much safe organized matter; coloured soils, under the same circumstances, absorb a greater degree of caloric than those of a pale complexion, especially those possessing a considerable proportion of carbonaceous or ferruginous matter. In dry soils those that are the soonest heated cool the most rapidly; but the darkest coloured dry soil containing a considerable mixture of decomposed matter, cools much

more slowly than a clammy, pale, earthy soil.

The above soils are also often characterized from the relative proportion of chemical agency which they contain, earths and earthy carbonates having a degree of attraction for many of the principles of vegetable and animal substances. If an acid solution of alumina be mixed with a solution of soap, the oily matter and alumina will unite, and forming a white powder will sink to the bottom of the fluid. On the same principle the extract from decomposing vegetable matter, boiled with pipe-clay or chalk, forms a combination by which vegetable matter is rendered more difficult of decomposition. Soils which contain considerable alumina and carbonate of lime, have considerable action of this kind, and from this chemical energy in the preservation of manures and other vegetable nourishment are denominated rich soils. With siliceous sands it is quite the reverse. The vegetable and animal matters they contain not being subject to attraction as above, are more liable to decompositive evaporation. In the case of black and brown moulds the earth is combined with an extractive matter, which derived from the decomposition of vegetables is of primary importance in vegetation.

The quality of the subsoil is often of as much importance as that of the soil itself: it may be classed under two heads; first, when it is of the same description as the upper soil, but differing from it only in not having been loosened by ploughing, &c. and enriched by manure; secondly, where it differs in its nature from the upper soil: in this case it is almost always of inferior quality. The much agitated question—whether deep ploughing beyond the usual depth, is beneficial or not, must depend for its solution on the nature of the subsoil and of the climate. The immediate effect of deep ploughing must in all cases be injurious; but the injury will soon pass away where the subsoil is of the same nature as the upper soil, whereas if the subsoil differs materially in quality from the upper soil, especially, where as is generally the case, when it does differ, it is impregnated with the oxyde of iron; there is great hazard in deep ploughing; and the mischief can only be eradicated by

much labour and expense, by frequent exposure to the air, the application of lime, &c., and by draining.

REMOVING OBSTRUCTIONS TO TILLAGE.

—In the first place; the *removing of stones, the eradicating of wood, the destruction of different sorts of plants, and the removal of such degrees of wetness* as may be injurious, before the business of ploughing or loosening the mould of the soil can be properly carried on must be first attended to. The stones that oppose obstructions, in this view, are principally either such as are met with in a loose state in the ground on its being ploughed, or such as are fixed in the soil, and incapable of being removed without much labour and difficulty. Some of these last are often of such a size as to present themselves upon the surface, and cause much land to be lost, by their not permitting the plough to come near them. Those which are concealed below the surface are, however, the most detrimental, as the implements are frequently destroyed, and much inconvenience experienced from them, before they can be perceived by the ploughman, though he may be perfectly attentive to the circumstance.

In all cases, land should be as much as possible cleared from such stones as retard or prevent the operation of the plough before the business of tillage be undertaken; as without due attention in this respect considerable loss may be sustained by the breaking of implements, and the great delay that must take place in the work.

In the clearing of land from wood, different methods must be pursued, according to the nature of the wood with which they are covered. Where there are large trees of the timber kind, they should be completely grubbed up at a proper season of the year, care being taken that the roots be as much as possible removed.

In cases where *broom, furze, brambles, or thorn shrubs*, have become of considerable size, the general method of proceeding is to cut them down as close as possible to the surface of the ground, and afterwards to dig round, and grub up the roots in the manner that the larger trees are cleared. With furze it is sometimes customary to set fire to them, in order to uncover their stems before any attempt is made to grub them up; but this is a practice that

ought to be as much as possible avoided, from the danger that may attend it, and the loss of the furze, as well as a large portion of the valuable vegetable matter accumulated in many cases beneath them.

As it has been found from experience, that such lands as have been attempted to be cleared from brushy plants of this kind, especially those of broom and furze, are extremely liable, from the roots and seeds that may be left in the soil, to have them coming up again in great abundance after they have been laid down to grass; it should be a practice to keep lands that are much disposed to their production in a state of tillage for such a length of time as may be fully sufficient, by the various means of cultivation, and the application and blending of lime and other suitable manures with them, to have them as completely removed as possible; and that when they are restored to the state of grass, to have them pastured, as much as can be conveniently done, with sheep.

Heathy lands should be cut as close to the surface of the ground as it can be conveniently done; and lime in its caustic state, should be applied in large proportions. When this sort of ground has been broken down and pulverized as much as possible by the operation of ploughing and harrowing, it should always, where not too stiff, be sown with some sort of close, luxuriant, green crop, such as turnips, peas, and tares, that may be fed off by sheep; but where it has a sour quality, and is more stiff, clayey, and adhesive with those plants that strike more deeply into the soil, as beans, rye, and oats of the gray kind. In many cases too, rape, peas clover, and vetches, will succeed in a very beneficial manner. But as the principal intention in most cases of breaking up this sort of land, is that of bringing it in a cheap and expeditious manner to a suitable condition after a grain crop or two for growing grass, the green crops, of whatever description they may be, should be consumed by animals upon the ground.

In whatever method such lands may be brought into the state of cultivation, the processes of tillage should not be carried further than the destruction of the heathy or other coarse plants, and the removal of the sour and unfriendly dispositions of such soils for

the growth of useful vegetable production. They should then be restored as soon as possible to the state of grass or pasture.

There is another description of land that is frequently to be brought into the state of tillage; this is that of the *boggy* kind. In these the first thing, after having them well drained by the cutting of proper ditches, which, where they are large, may serve for their inclosure; is by giving the ridges a suitable form: in order to aid this, pare off and level the surface by means of the spade or plough. Such matters as are of little value being deposited in the hollows, while those that are of a good quality may be mixed into a compost with good dung, where it can be procured, or with lime; together with the spare earth taken from the ditches, which should be immediately spread equally over the land, and incorporated, as much as possible with it, by ploughing it up with a very slight or ebb furrow, in order that the uniting materials may not sink too deep for affording due support to the crop, that may be cultivated on it. Indeed, though deep ploughing may sometimes be of utility in first opening up these soft soils, it should never be had recourse to when the application of manure is to be made; and on this account also the ploughings after the taking of different green crops should only be slight. It is seldom proper to continue soils of this description for any great length of time in the state of tillage, as from their great moisture, on account of the general flatness of their situations, and their being liable from continued ploughing to become very loose and open, so as not to afford proper nourishment and stability to the roots of the crops. This sort of land will in general be the most advantageous in a state of grass.

The most beneficial sorts of crops for these soils will in general be turnips, rape, or potatoes.—The light and drier parts will be the most adapted to potatoes, as their bulbous roots will be there the most able to spread and extend themselves, and consequently produce large crops. These crops will, in the stiffer sorts of these soils, leave the land in a suitable condition for wheat or oats, and in the lighter for barley or rye.

Moss lands, from their being much disposed to the throwing up of grass, are not so proper for the growing of

grain crops, but a crop or two may frequently be taken after potatoes or turnips, especially where liming has been performed some length of time. Oats and barley are mostly good crops, but such land is often too light for wheat. Where barley is employed, grass seeds are frequently sown with it, but it is probably a better practice to put them in separately. On those soils, rye-grass, as well as white and yellow clover, have been found to thrive extremely well, especially where they were in a proper state of preparation for them, as by the growth of potato or turnip crops. And though red clover has not always succeeded, it is probable, that in such mosses as are not of the deep kind, it will prove an useful plant. In some districts, it has been found that clover may be sown with great advantage immediately after the potato crop, when it has been taken off early.

It is evident, from what has been advanced, that as there is much variety in soils of this kind, they will of course require different modes of tillage. Where they are very thin, and deposited upon a loamy or clayey substratum, it may be a good practice to plough so as to bring up a portion of them, by which, and the use of lime, the land may be rendered highly productive.

IMPROVEMENT OF SOILS.

For the improvement of soils numerous methods have been devised, such as by pulverization, by fallowing, by incineration, by consolidation, by exposure to the atmosphere, by an alteration of their constituent parts, by changing their condition in respect to water, by a change in the kinds of plants cultivated, and by their position in respect to atmospherical influence. *Pulverization.*—This is needful, in the best of soils to facilitate the admission of air, rain, and the warmth of the atmosphere, &c., the first object of this is to give scope to the roots of vegetables, on the numerous fibres of which the prosperity of every plant in a great measure depends; and also to increase the capillary attraction of the soil, by which its moisture is more uniformly applied. Water being essential to the growth of plants, not only by its immediate application, but by that operation by which it facilitates the extraction of vegetable
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matters, the soil if not naturally so, should be so constituted artificially, as to retain a requisite portion; for the want of water will impede the germinating principle, and render even manure an ineffectual auxiliary. The different species of earths, being among the worst conductors of heat, it is necessary to lay the land open, and by the free ingress of the warm air, and tepid rains of spring, artificially to increase its temperature. *Pulverization* also contributes to the increase of vegetable food, conveys water, and with it carbonic acid gas, to the roots of vegetables; accelerates the putrefaction of vegetable and animal substances by the combined actions of heat, light, air, and moisture, buries a portion of the atmospheric air in the soil: in short, so numerous are its advantages, that Tull and others conceived no other assistance to be necessary. No principles, however, admit of indiscriminate application; for while the pulverization of some lands contributes to their improvement there are others that require consolidation.

"*The depth of pulverization,*" Sir H. Davy observes, "must depend upon the nature of the soil, and of the subsoil. In rich clayey soils it can scarcely be too deep; and even in sands, unless the subsoil contains some principles noxious to vegetables, deep comminution should be practised. When the roots are deep, they are less liable to be injured, either by excessive rain or drought; the radicles are shot forth into every part of the soil, and the space from which the nourishment is derived is more considerable than when the seed is superficially inserted in the soil."

The practice of fallowing is attended with numerous advantages to soils; the weather has free admission to their interior parts; the soil is thus heated to a degree which would be impossible while covered with foliage: weeds are in a great measure eradicated, and the top, bottom, and middle of the soil more effectually blended. Where fallows are judiciously applied, and the land by frequent ploughing and harrowing left for twelve months, in a state of constant tillage and movement, the profits will amply repay both the trouble and expense. Soils are to be altered by the addition of those ingredients in which
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they are deficient, and the subtraction of those in which they abound. Thus a soil strongly impregnated with sulphate of iron, will be sterile; but it is to be improved by the application of quick-lime: also a soil containing too great a proportion of peat, drifted sand, gravel, &c. is to be improved by taking them away, as the most simple and effectual mode.

Sir Humphrey Davy thus explains *the theory of burning soils*. He says, "it rests entirely on chemical doctrines. The bases of all common soils are mixtures of the primitive earths and oxide of iron; and these earths have a certain degree of attraction for each other. To regard this attraction properly, consider the composition of any common silicious stone. Feldspar, for instance, contains silicious, aluminous, calcareous earths, fixed alkali, and oxide of iron, which exists in one compound, in consequence of their chemical attractions for each other. Let this stone be ground into impalpable powder, it then becomes a substance like clay; if the powder is heated very strongly, it fuses, and on cooling, forms a coherent mass similar to the original stone; the parts separated by mechanical division adhere again in consequence of chemical attraction. If the powder be heated less strongly, the particles only superficially combine with each other, and form a gritty mass, which, when broken into pieces, has the character of sand. If the power of the powdered feldspar, to absorb water from the atmosphere before and after the application of the heat, be compared, it is found much less in the latter case. The same effect takes place when the powder of other silicious or aluminous stones is made the subject of experiment, and two equal portions of basalt ground into impalpable powder, of which one half had been strongly ignited, and the other exposed to a temperature equal to that of boiling-water, gained very different weights in the same time when exposed to air. In four hours, the one had gained only two grains, whilst the other had gained seven grains. When clay or tenacious soils are burnt, the effect is of the same kind; they are brought nearer to a state analogous to that of sands. In the manufacture of

bricks, the general principle is well illustrated; if a piece of dried brick earth be applied to the tongue, it will adhere to it very strongly, in consequence of its power to absorb water; but after it has been burnt, there will scarcely be a sensible adhesion.

The soils improved by the burning process, are those which contain too much dead vegetable fibre; and which, in consequence, lose from one third to one half their weight by torrefaction; and those which contain a superabundance of stiff clays and marls; but poor sandy soils are injured by this process. The common advantages of incineration are, that it renders the soil not only less compact, but less tenacious, and retentive of moisture; affording considerable improvement to such as are cold and damp. It diminishes the coherence and tenacity of clays, and destroys useless vegetable matter, converting it into manure. The water of the soil should be withdrawn when abundant, and when deficient should be supplied. Stagnant water is exceedingly pernicious to all classes of useful plants. Springs are more injurious than surface water, as being colder and generally permanent. Hence the propriety of under-draining, &c. as well as removing every obstacle that would prevent the percolation of water to the strata below.

The great art of *irrigation* is the imitation of nature in all her various modes of communicating moisture, applying water especially in the morning and evening at moderate intervals, and under a clouded sky. It may be applied by surface or subterraneous irrigation. If employed too frequently it would produce the same effects as attend stagnant water, land springs, or aquatic soils. If applied after hot sunshine or other violent heats, it would check evaporation and destroy life. That water in which fish thrive is generally the best for meadows, and the overflowing of alluvial lands may be also employed to manure and enrich the soil. Shading, sheltering, &c. by walls, hedges, plantations, &c. changing the condition of lands with respect to solar influence, by erecting mounds, and forming slopes, so that the surface may be more or less at right angles with the plane of the sun's rays,

have frequently a very beneficial influence upon the quality of the soil.

MANURES.

An increased population requires more abundant stores of food for man, and the beasts immediately under his command, than were before necessary: to this end, where the extension of land cannot be obtained, recourse must be had to the enriching of that which is already in possession, whenever it becomes deteriorated by constant and heavy cropping, with such plants as exhaust the pabulum of vegetables; and also to improve such soils as are by nature less adapted than others to the production of advantageous crops.

Besides the methods we have already spoken of for the improving of lands, mankind have discovered various substances, which, when judiciously applied, possess the power of increasing the fertility of soil in a wonderful degree. The substances are numerous, and always near at hand. They arise from the decomposition of animal and vegetable matter, and from the agency of fossil and saline substances.

From the changes that are constantly taking place among bodies in nature, and the new combinations which are formed in consequence of those changes, a great variety of matters are unfolded, elaborated, and prepared for the nourishment and support of vegetable life.

Some of the substances which contribute in this way possess considerable fluidity and volatility, such as *water*, and various gaseous materials, as *oxygen*, *hydrogen*, *azote*, and *carbonic acid*, in different states of combination; while others are more gross and heavy, and require to be applied and incorporated with soils, or spread out upon their surfaces, in order that they may produce their effects in promoting vegetation. It is principally to these, as being the means of sustaining different sorts of plants as crops, that the attention has been given by practitioners in agriculture; though it is equally obvious that they must undergo constant changes, and be reduced to their more elementary principles, where they can be taken up, and converted to the increase and support of vegetables. In the various materials which the art and industry of man have rendered capable of

being beneficially employed in this manner, there is great diversity; some are found to yield the matters which are necessary for the support of plants much more readily and more abundantly than others, as animal, vegetable, and all such substances as are rich in mucilage, saccharine matters, and calcareous earth, and readily afford carbon, phosphorous, and some aerial fluids; while others, that are greatly deficient in all or many of these principles, or do not readily part with them, are found to be of much less utility, when employed in the way of manures. This is probably a principal reason why some sorts of manures, or substances, when put upon grounds, are so greatly superior to others, used at the same time, and in the same manner and proportion.

There are, however, many other ways, in which substances, when applied to soils, may render them more fertile and productive, and contribute to the aid of vegetation. Some, besides furnishing such matters as are suitable for the purpose of promoting the growth of plants, are known to add considerably to the quality of vegetable and other matters contained in the soils on which they are placed, and thereby provide a more suitable and convenient bed for the reception of the roots of plants; others contribute little in this way, but operate chiefly upon such materials as are contained in them, breaking down their organization or texture, and thus setting at liberty different volatile and other ingredients, by which new compounds are formed, and brought to such states as are the most adapted to the support of vegetable life; others again act principally by producing certain changes and alterations in the constitution or texture of soils, such as rendering them more open and porous, or more stiff and compact, and by such means bringing them into the most proper conditions for the bearing of different vegetable productions; and there are still others that contribute in all or several of these ways at the same time.

Substances of the animal kind, when reduced by the process of putrefaction, or other means, into a soft, pulpy, or mucilaginous state, are found by experience to afford those matters which are suited to the nutrition and support

of plants with greater readiness, and in more abundance, than most other bodies that can be employed. By chemical analysis it has been seen that the component materials of these substances, so far as agriculture is concerned, are principally water, jelly, or mucilage, and saccharine oleaginous matters, with small portions of saline and calcareous earthy substances. Hence animal matters, though they agree in some circumstances with vegetable productions, each having, in common water, saccharine, and calcareous matters, are far more compounded; and in animal substances, some of these materials are in large proportion, while in vegetables they only exist in a very small degree; and the jelly, which in some measure resembles the gum and mucilage of plants, differs likewise from them, in its having much less tendency to become dry, as well as in its property of attracting humidity from the atmosphere, and of running with great rapidity into a state of putrefaction and decay.

All these principles of animal substances are resolved by their ultimate decomposition into other matters, such as the different gaseous fluids that have been mentioned above, carbon, phosphorus, lime, &c.

Animal substances of every kind, on being deprived of their vital principle, have a quick tendency to take on or run into the state of putrefaction; a process which is considerably affected and influenced by the circumstances under which it is produced. But in the horny and more compact animal matters, this tendency to putrefaction and decomposition is, under similar circumstances, much less rapid than in such as are of a less firm and dense texture.

HARD ANIMAL SUBSTANCES.—In the matters of this sort that are employed as manures, there are considerable differences in respect to their texture and firmness, some being quite firm and solid, such as *bones, horns, hoofs, shavings of horn*, and some other similar substances, while others are more soft and pliable. The *bones of all animals* are capable of affording much nutritious matter to plants, but those which are procured from cattle that have been killed when fat, are the best for the

purposes of manure. Those which have been boiled are far inferior, in this view, to those which have not undergone that process, as by such means they are principally robbed of their oily and mucilaginous properties, and consequently must yield much less nourishment to the immediate crop, whether it be grain or grass. All these sorts of substances require to be ground down in mills constructed for the purpose, or otherwise reduced into small pieces, before they are laid on and mixed with the soil. They are excellent for potatoes.

These substances are constituted of a considerable proportion of mucilaginous or gelatinous matter, a slight portion of fat, and an earthy salt composed of the phosphoric acid and calcareous earth. If great heat be applied, they afford a large quantity of hydrogen gas, carbonic acid gas, and a volatile alkaline liquor. From the nature of these different principles, it is evident that some sorts of substances may be blended and united with the reduced particles of bony matters, so as to promote their effects, as manures, in a considerable degree, such as lime, chalk, peat, earth, and good vegetable mould, in suitable proportions, as by such means new combinations may be formed highly favourable to the process of vegetation.

SOFT ANIMAL SUBSTANCES.—There are various matters of this nature that may be of use for the purpose of improving land as manure, some of which have yet been but little attended to by the farmer. Of this sort are *greaves*, or the *residuum* which is left after the making of candles, and the *scum* which is collected in the boiling or refining of sugar.

Different trials with the former have fully convinced us that it is a substance that possesses great powers when employed as a manure; and although it is a substance which is generally procured at a high price, from its going a great way, and being a lasting manure, it may probably be more frequently had recourse to than has hitherto been the case. It is mostly procured in the state of hard compressed square cakes, though sometimes in a soft condition, without having undergone any pressure. When in the former state, the cakes must be broken down and reduced into as great a

state of division as possible, which may be rather a troublesome and expensive process, except a mill, or some proper machine for the purpose, be employed. But when it has been even reduced to the finest state possible, it will still be improper for application as a manure, until it has been mixed and incorporated with a pretty large proportion of some rich earthy substance with which it may combine. It is excellent for turnips.

A combination of *lime* and *greaves*, mixed with mould from the head-lands, in the proportion of about fifty bushels of lime to a ton of *greaves*. This composition resembles sugar scum, which consists of lime and bullocks' blood.

Lime might thus be combined with *bones* or *woollen rags*, or with a compost of *earth* and *night-soil*; and would certainly greatly facilitate their conversion into manure, as well as render them more active in producing their effects in the support of vegetable crops; and by some of their properties being absorbed by the lime, during the time of their decomposition, and afterwards parted with more slowly in the soil, they may also by such means be, probably, rendered more durable and lasting, as manures.

Lime operates upon other substances intended for manure as a kind of yeast, it requires therefore to be well mixed, that every portion of the manure may be properly fermented.

There are still more substances of the animal class, such as the *blood*, *scum*, *wool*, *hair of animals*, *refuse of glue-makers*, *the cuttings of felt-monsters*, *the clippings of furriers*, *the scrapings of oil-leather*, and *the chips or waste of shoe-makers*, which may be made use of as manures, when they can be collected in sufficient quantities. These animal materials, from their abounding in mucilage and oil, their great attraction for moisture, and their being readily soluble in water, contribute quickly to the support of vegetation, but are not probably so durable in their effects upon land as many other substances. Hence they should only be made use of with a view to the immediate crop, which, we believe, is pretty much the case in those places where they are obtained in such quantities and employed for the purposes of manure.

Other animal substances of the fish

kind, as the *blubber* remaining after the preparation of oil from the *whale*, and other large fishes, and different sorts of small *fish*, both of the shell and other kinds, may be employed as manures; and also the offals of such animals, where they can be procured in a large quantity, as in large towns, sea districts, and where they are cured or prepared in great numbers for the market.

These substances may be readily reduced to that state which is proper for manure, by mixing with them a small portion of the carbonate of lime, and afterwards according to circumstances, a quantity, two or three times more than the whole, of good vegetable mould.

The refuse of slaughter-houses and butchers' shops may likewise be prepared and made use of in a similar manner to that of fish. For as the manures that are formed from these animal materials are capable of affording much elastic volatile matters during their decomposition, they of course require to be well mixed and blended with such earthy substances as they can combine with, and render soluble, and in proportion suited to their powers, in order to produce the most beneficial effects on vegetation.

ANIMAL DUNGS.—The animalized substances that are, however, most generally made use of as manures, are the excrements of various kinds of animals, which are found in very different conditions, or states of preparation and richness, proceeding in some measure from the kind of food on which the animal has been fed, the matters with which they are incorporated, and the texture of the substances themselves.

The dung of fat animals is unquestionably more rich, and consequently possesses greater powers of fertilization than the dung of lean ones; and the quality of the dung of every sort of animal will in a great measure be proportioned to the goodness or poverty of its food. Thus, when the animal is fed on oily seeds, such as lint, rape, and others of a similar nature, it will be the most rich; when kept on oil-cake, or those seeds which have been deprived of part of their oily matter, the next so; on turnips, carrots, and such like vegetable roots the next; on the best hay, next; on ordinary hay, next; and on straw, perhaps, the poorest of all.

The urine of animals appears to be a more perfect extract from the animal

system than the other; it is, therefore, surprising that this valuable substance is not more attended to by agriculturors. Let it be mixed with the dung-hill, or else carted to the field after it has passed through the putrefactive fermentation. Its effect on land is immediate.

Some manures of this kind, such as the *soil of privies*, is sometimes met with in a state fit to be applied to the ground, when not much mixed with fluid matters, such as urine. It most frequently happens, however, that it is in such a liquid state as to require other more solid substances to be blended with it, before it can be conveniently applied to the soil. In doing this, too little regard seems to have in common been paid to the choice of the most proper materials; but it is obvious, that such as can be the most fully acted upon, and the most readily converted into the states suitable for affording the nutrition of vegetables, by the principles of the matters thus employed as manures, must be the most adapted for the purpose, as well as the most beneficial. When, therefore, the manure made use of in this way is either wholly or principally constituted of such animalized matters, as from their fluidity are in an improper state or condition to be set on land without having other substances previously mixed with them, such peaty, boggy, or black vegetable earths should be chosen as contain large proportions of matter, which the ammonia or volatile alkali, so abundantly provided by the decomposition of such substances, may exert itself upon, and reduce into that state of solubility which is suitable for promoting the growth of plants.

The results of experiments attentively made in this way, indeed, clearly demonstrate that an inconceivable loss is incurred by the inconsiderate practice of exsiccating human excrement, as well as the negligent custom of permitting the gaseous or liquid parts of dung-heaps to evaporate or run away. The trials which we have been enabled to make, also lead us to suspect that it is a much more wasteful practice to apply these liquors to ground in their uncombined state, than in conjunction with such earthy materials as have been mentioned above. Besides, much of them must be imperceptibly carried off, by the process of evaporation, even

when they are carried out in the most favourable seasons of the year; and they cannot in this way always be made use of on those soils that contain a sufficient quantity of those earthy materials or principles with which they can readily form combinations, and exert their most beneficial and fullest effects. It may be demonstrated, by experiment, that yard and stable-dung should be applied to the land in its half decomposed state, and not be suffered to remain in heaps until the putrefactive fermentation has reduced it to over putridity.

We are decidedly of opinion, that the soil of privies is a manure of the most enriching kind, but that its effects are not so lasting as those of many other substances. In some trials which have been lately made with it, it has produced such astonishing fertility, as induces us to conclude that it exceeds all other sorts of manure that can be put in competition with it for the first year after its application. The second is of some service, but in the third its effects nearly, if not quite, disappear. The circumstances which render this sort of manure so immediately active in promoting vegetation, and so quickly deprived of its beneficial influence, would seem to be from the great quantity of elastic principles which it contains in a loose state of combination, and the small quantity of earthy matter which it is capable of supplying to the soil, by the last stages of decomposition or decay.

This view of the nature of the manures afforded by different animals, should lead the practical agriculturist to be more attentive to the subject, in order that he may render them more abundant, and be capable of employing them under the most favourable circumstances, which cannot be the case while they are, as at present, indiscriminately mixed and blended in the common dung-heap.

It is, however, from the larger animals that the farmer derives the principal part of the dung that is made use of as manure, in the cultivation and improvement of land. The dung of such horses as are highly fed being found, as has been already seen, to be much more valuable for the general purposes of agriculture, and some uses in horticulture, than that which is made by

horses when fed with hay or grass only. Where the animals are kept in the latter way, it is probably not so good as that of well-fed cows, and neat cattle in general, as in these it may, perhaps, become more animalized from the circumstance of their food being more intimately blended with the saliva, or other juices, during the ruminant state of feeding in such animals. The dung of horses is, however, in common much more disposed to the process of putrefaction, and causes more heat than that of cows and other neat cattle; and indeed these are the chief distinguishing circumstances between them as manures. The dung of neat cattle may also, on account of its less disposition to run into the state of putrefaction, contribute more of the earthy material to the land on which it is applied. Hence, probably, its superior utility on the leaner and poorer or thinner sorts of soil. The dung and urine of animals when newly voided, are not, except when the animals are morbid, in a putrescent condition, the length of time in which they remain in their bodies being too short for its fully taking place; but some degree of, or tendency to, putridity is constantly necessary to their discharge.

From the experiments that have been made with the dung of sheep, it is evident that it is equally valuable with that of many other animals that feed in the same way, but agriculturalists have not yet turned their attention sufficiently to the means of collecting and preserving it, so that it may be used alone as a manure. The method by which it is at present applied to land is by folding the animals upon it, under which method of management, on many soils, a great part of the advantage must be derived from the operation or action of the ammonia of their urine upon the vegetable matters contained in them, as well as from the consolidation produced by their treading. It is well known that the urine and dung of sheep want no fermentation previous to its being applied to the land; the sooner therefore the seed is sown after folding, the greater is the effect.

Vegetable, as well as animal substances, when deprived of their vital principle or life, are soon rendered fit, by the separation, reduction, and ultimate decomposition of their constituent

principles, for the nourishment and support of new plants. This process is greatly promoted, in all kinds of substances, by the materials being exposed to the free influence or agency of atmospheric air, moisture, and a middling degree of heat; various matters are set at liberty, by which different new combinations take place, that are capable of promoting vegetation in different degrees, and upon which their utility as manures, perhaps, chiefly depends. The stages of this decomposition have generally been supposed regularly to succeed one another, from that which is productive of sweetness, through the vinous and acetous, to that which is the ultimate result of putrefaction. Different sorts and parts of organised matters, when dead, undergo many different sorts of chemical changes, which are different according to the degrees of heat, the quantity of water, and of air, to which they are exposed.

In the vinous fermentation or process which commences after the saccharine, carbon becomes united with pure air, in a large proportion; and it is probable that, at the moment of their combination, while they are in the form of a liquid, and before they assume the gaseous state, they may be taken up by the roots of vegetables.

The substances of the vegetable kind that may be advantageously converted into manure are so extremely numerous, that it is impossible within our limits to describe them. All kinds of green vegetable productions may be employed in this way; such as the luxuriant weeds of rivers, lakes, ponds, and ditches; fern, and the refuse of different kinds of garden vegetables. Where green materials of this nature are made use of, they should always be cut down while in their juicy state, just before their flowers begin to appear, in order that they may be in the most suitable condition for becoming quickly putrid, and to prevent the injury that might otherwise be sustained from the vegetation of their seeds. They are afterwards to be collected into heaps of a moderate size, and their putrefaction promoted by their being thrown together as lightly as possible, and the occasional sprinkling of them with water, if the season be hot and dry; and as lime is found, when applied to vege-

tables in their green moist state, to disengage from them both hydrogen and azote, by the combination of which volatile alkali is produced, it may be advantageous to blend a portion of lime at first with the heaps, and afterwards add a suitable quantity of peat earth, or good vegetable mould, for the alkali thus formed to act upon. By this method, the quantity of manure from such substances may be greatly augmented, and rendered more valuable. But from dry materials, such as hay, straw of different kinds, fern, and rushes, such additions cannot be had recourse to with equal success, unless where much of the dung and urine of animals have been incorporated with them; their resolution and decay may be greatly promoted by their being kept in a state of moisture, without the water being suffered to stagnate upon them, and by their not being permitted to be trodden down too much by cattle, or by other means, in the farm-yards.

Another beneficial means of vegetable manure, which is yet far from being sufficiently practised, is that of providing full crops of succulent green vegetables, such as clover, buck-wheat, tares, vetches, spurry, pease, beans, turnips, and many other similar plants, to be turned down by the plough, in order that they may undergo the putrefactive process under the ground, and by that means be converted into manure, and supply the nutrition of plants.

Sea-weed is another vegetable production which is capable of being employed as a manure with great advantage, and should never be neglected where it is within the reach of the farmer. In some places it is the practice to spread it upon the lands as soon as possible after being cut from the verges of the rocks, on the different sea coasts, or collected after being left by the tides, and to plough it in; where this method is adopted, as little time as possible should be suffered to elapse after the cutting or collecting of the weed, before it is ploughed down; for as the plant in its green or succulent state readily decays and becomes putrid, if there be any considerable delay in the performance of the business, especially when the weather is hot, much of its valuable properties as a manure is dissipated, and carried away by means of evaporation.

Bark, which has been made use of for the purpose of tanning leather, may likewise be employed as a manure; when used in this way it should be collected into moderate sized heaps, before it has become dry by too much exposure to the heat of the sun and wind; and then by having a quantity of lime mingled with it, and being kept slightly moistened with water, its putrefaction and decay may be greatly promoted.

The mud taken from the bottom of rivers, ponds, and other places where water has stagnated for some length of time, fresh or maiden earth, and the scourings of old ditches, are substances that may frequently be employed with advantage as manures, being principally composed of the recrements of decayed vegetable matters. They should not, however, be put upon grounds, especially those under grass, until they have been reduced into a considerable degree of fineness, by means of frequent turning over, and the mixing of a portion of lime, rotten dung, or other materials of the same kind, with them, in order to promote and render the decay of the solid parts fuller and more complete.

Marl like lime is a stimulant for forcing the soil to produce crops of corn and grass. It consists of two kinds. Shell-marl; and earth-marl. Shell-marl consists of animal shells dissolved; earth-marl is a fossil. The colour of the latter is various, white, black, blue, red; and its hardness is as various as its colour, being sometimes soft as clay; and at other times hard and solid as stone. It promotes vegetation in all the different ways; feeds the plants, communicates to the soil a power of attracting the food from the air, enlarges the pasture of plants, and prepares the vegetable food for entering their roots.

Substances of the calcareous kind, which are to be considered under this head, produce effects more or less powerful in promoting the growth of vegetable crops, in some measure, according to the state and quantity in which they are applied, the nature of the soils on which they are employed, and the properties of the matters with which they are combined.

Substances that contain much saline matter in combination with their earthy and other ingredients, are found, in many instances, when properly employed as

manures, to contribute greatly to the support of vegetation. The materials principally made use of in this way are the refuse of different manufactures, such as bleaching and soap-boiling, where they can be procured in sufficient quantities, as in the vicinity of large towns, and where such manufactures are carried on in an extensive manner; the ashes remaining after the combustion or burning of various green vegetable matters, wood, pit-coal, peat, &c. and some other substances, such as soot and sea-salt.

It is most probably to the different alkaline principles contained in these substances (from the great facility and power which they possess of acting upon and dissolving the parts of animal and vegetable matters, especially such of the latter kind as have been rendered insoluble by the absorption of the oxygen, or pure air of the atmosphere, from long or frequent exposure to it), that their beneficial effects as manures are chiefly to be ascribed.

But these substances, besides their forming in the soils, or the earthy materials with which they are mixed, such compounds as are beneficial in promoting the growth of vegetables may be useful in many cases when properly applied, and used in sufficient quantity. In correcting acidity, in altering the state or condition of the lands, as by the taking away of moisture from the surface where it prevails in an over-proportion in meadows and pastures, which thereby supports crops of coarse vegetables, and by rendering the texture of such grounds as are under the plough more open and friable, consequently more suitable for the reception of the roots of corn crops.

It is evident, from what has been already observed on the nature of the different substances that are capable of being made use of as manures, that they may frequently be mixed and blended with each other, or with substances of other kinds, and by such means be not only considerably increased in quantity, but in many cases rendered more effectual and more suitable for application than in their simple states; but at the same time, that some of them may be mixed and incorporated in this way with much more advantage than others; for though the general experience of farmers has fully

shown the great importance and utility of employing compound manures, or composts, little attention has, till lately, been paid to the compounding or mixing together of such substances as are, from the principles which they originally contain, or which are formed from them in the changes which they undergo in the different stages of their decomposition, adapted to act in the most suitable manner for producing such combinations or alterations in the materials, as are capable of being beneficial in the promotion of vegetation when they are employed as manures.

Farm-yard manure, which is the most general application of any, from its being formed by the decay of various kinds of vegetable matters, such as hay, straw, fern, and many other materials of a similar nature, with which the dung and urine of animals is incorporated and combined, must be considered as a compound substance. And from the large proportion in which such vegetable productions enter into its composition, and the quantity of earthy materials that is in most cases, especially where the management is upon a judicious plan, added by the laying of suitable bottoms, it is not so frequently necessary to be blended with other substances that are usually employed in forming composts. But from most of the vegetable materials that constitute the chief part of this sort of manure, being made use of in a dry and hard state, they do not so quickly ferment or run into the state of decay, notwithstanding the proportion of animalized matters that may be mixed with them; it therefore becomes an useful practice to turn them over, by which their complete putrefaction may not only be promoted, but the different materials be more minutely blended together, on both which accounts they may become more useful when applied as manure upon land. In the forming of this manure, care should also be constantly taken that the heaps be so situated as that they may not become too dry, or too much soaked in water, as in either case they must be greatly injured. Whenever it may be requisite to incorporate any earthy material with this sort of manure, the agricultor should always carefully attend to the state or richness in which it may exist in the yard, and proportion such additions accordingly.

It will, however, never demand nearly so large a proportion, as such manures as consist almost wholly of animal matters.

Where animal matters are collected and thrown together in any quantity, there can be little doubt but a great increase of good manure may be provided by mixing with them, as has been already observed, rich surface-mould, peat-earth, or the scrapings of old ditches and roads; as by such a practice the ammonia, formed during the decomposition of the animal substances, is prevented from escaping, as would otherwise be the case, which, by combining with and acting upon the earthy materials, quickly renders them proper for the purposes of manure. As substances of the animal kind have been shown to run very rapidly into the state of putrefaction, they may frequently be incorporated with such vegetable materials as are little disposed, or with difficulty made, to rot or become putrid, and by such means useful composts be more expeditiously formed. In making use of such earthy substances as have been mentioned, it may be of much advantage to have them exposed to the influence of the atmosphere for a considerable length of time, frequently turning them over, before they are mixed with the manures, as by such means they become in a more pulverized state, and are capable of being more intimately blended with such materials, and afterwards spread over the land with much greater equality, a circumstance upon which their effects very much depend. If, in performing this business, the earthy substances be formed into a sort of ridge, about five or six feet in height, and nearly the same breadth in the bottom, they will be in the most proper situation for being united with dung, or other matters that may be employed.

In the application of manure to land, several circumstances are necessary to be considered, such as the state or condition of the substances which are to be made use of, the nature of the soils on which they are to be laid, the kind of crop that is to be promoted by them, and the season in which they are put into or upon the ground.

As we have already seen that changes are continually taking place from the moment the materials of the dung-heap are thrown together, to the period in

which they are reduced into a black carbonic earthy matter, and that in most of the different stages through which they pass in this process of decomposition, such substances are formed as are capable of contributing to the nutrition and support of vegetable crops; it seems probable, that in cases where manures are to be turned into the ground, and such crops cultivated as require a supply of nourishment for a considerable length of time, they should be employed in their long or more imperfectly reduced states, as by the heat which is evolved in the commencement of their dissolution, the process of early vegetation may be greatly promoted, and their gradual decomposition and decay afterwards, under the ground, afford a more durable and regular supply of nutrient materials, and thereby contribute more effectually to the growth of the crops; but that where they are to be buried in, or applied to, the surface of the soil, and intended merely for the benefit and support of such crops as are of short duration, or quickly arrive at their full growth, they may be more advantageously made use of after they have been more fully and completely reduced, as in this state the manure is, in the case of grass lands, not only capable of being spread out in a more regular and uniform manner, by which it becomes more evenly as well as more generally carried down to the roots of the plants by rains, but it is in the most suitable condition for allowing the young plants the means of springing up with facility, and at the same time, whether used under or upon the soil, of affording the crops that abundant supply of nourishment which is necessary to their speedy growth and great luxuriance, and by these means to contribute the most perfectly to the promotion of their increase.

And as in the slow and gradual decomposition of the materials which are made use of for manures, when slightly deposited beneath the soil, there is much less waste of heat and those elastic matters which contribute so greatly to the support of vegetation, than where they are made to undergo the various processes of dissolution in large masses, as in dung-heaps, they may probably sometimes on that account be most advantageously employed in this state.

On this principle too the ploughing down of fresh vegetable crops, in many cases, in their most succulent states, may be a more economical as well as more beneficial practice; especially in such light and dry kinds of soil as will more readily admit of their gradual putrefaction and decay, than to cut and take them off for the purpose of being by other means converted into manure. It seems likewise probable, on the same grounds, that for the production of crops of bulbous-rooted vegetables on the more stiff and tenacious soils, the matters made use of as manures may be employed with the greatest advantage, when put into the earth before they have undergone any great degree of decay by means of putrefaction, as in this way there is no waste, the whole being ultimately converted and applied, though more slowly, to the support of the crops.

As to the seasons in which manures may be put into the soil, or spread out upon its surface, with the greatest benefit and advantage (though in practice it must, in some measure, depend on the state of the land and the convenience of the farmer), it should, in cases where they are buried in the ground, be as nearly as possible to the periods in which the seeds or roots which they are designed to support, are sown or placed in the earth; and in the latter case, or where they are to be laid upon the surface of the land, it ought to be just before the crops of grass, or other vegetables, begin naturally to spring or shoot forth.

And by the application of such manures as are employed in the way of top-dressings in the beginning of the spring, they are laid on in the most favourable periods for affording their nutritious principles, and for their being drank up by the roots of plants, consequently become useful at the time they are most wanted for the promotion of the crops, and the great waste which must otherwise be caused, either by the excessive falls of rain and floods in the winter season, washing down much of the valuable properties into the adjoining rivers and ditches, or the evaporation of their more volatile or elastic matters by means of the summer heats, is most effectually guarded against and prevented.

On all these accounts, therefore, far-

mers should contrive as much as possible to apply the manures, intended as top-dressings to grass lands, as early in the spring as it can be conveniently done, which may be easily managed on those that are dry, and on such as are inclined to be wet and poachy, it may probably be greatly facilitated by having small light carts constructed for the purpose, and placed on broad cylinders as wheels.

In the application of manures to lands under tillage, as well as those in the state of grass, there are a few other circumstances that require the attention of cultivators; such as the depth they may be deposited in the soil, the modes of putting them upon the ground, and the most economical methods of employing them.

In respect to the advantage of using one sort of manure in preference to another, it may be observed, that as animal matters are found in general to undergo more speedily the process of putrefaction or decomposition, than those of the vegetable kind, and as in most instances they afford those mucilaginous and elastic principles that contribute so largely to the support of vegetable life in greater proportions; such manures as are either wholly or in a great measure composed of them, must be the most beneficially employed, where quick and abundant supplies of nourishment are required, as in the growth of all the more gross and luxuriant crops, whether of grain, plants, or grasses; and that as those vegetable substances which contain saccharine, farinaceous, oily, saline, or mucilaginous principles in the largest quantities, are ascertained from experience to proceed the most readily into the state of dissolution or decay, and consequently to afford more fully and more expeditiously the nutrient food of new plants; where manures are principally formed from them, they should be preferred to such as have been made from the harder and more ligneous vegetable substances, that contain such properties in scarcely any, or much smaller degrees, for all the purposes of agriculture.

It is of great importance to take great care with regard to farm-yard dung, to mix it well together and store it in heaps; as it should neither be exposed to rain to wash away its nutritive qualities, nor to the rays of the sun or rough winds to exhaust them. Straw being

the basis of this kind of manure, the farmer should carefully procure and preserve as much straw as he possibly can; and a proper preparation of manure, by a judicious mixture of the several bodies of which it is composed, will amply repay the farmer, as the prolific and nutritive qualities of the manure itself will by this means be much increased. Upon farms where the management of manure is well understood and practised, it is an important matter to have dunghills of all ages, and ready for use whenever the situation of a field calls for a restorative.

As *wheat* is the most valuable grain cultivated in the British Isles, we shall treat of the several processes connected with its culture in the following order; *first*, of the soils best adapted for the growth of wheat; *second*, of the culture of the soil required for that grain; *third*, of ploughing; *fourth*, of the varieties of seed; *fifth*, of the way in which it is sown; *sixth*, of pickling the seed, so that it may be preserved from being smutted or blacked; *seventh*, of the diseases to which wheat is liable in different stages, &c.; *eighth*, of harvest management; *ninth*, of threshing the grain, and preparing it for the market.

THE SOILS BEST ADAPTED FOR THE CULTURE OF WHEAT,

Are rich clays and heavy loams; but these are not by any means the only description of soils on which it is cultivated. Before the introduction of turnips and clover, all soils but little cohesive, were thought quite unfit for wheat; but, even on sandy soils, it is now grown extensively, and with much advantage after either of these crosses. The greater part of the wheat crop throughout Britain, however, is probably still sown upon fallowed land. When it succeeds, turnips consumed on the ground, or clover cut for hay or soiling, it is commonly sown after one ploughing; but upon heavier soils, or after-grass of two or more years, the land is ploughed twice or three times, or receives what is called a rag fallow.

ON RICH CLAYS, wheat may be cultivated almost every second year, provided due care is taken to keep the land clear, and in good condition. A summer fallow once in four, six, or eight years, according to seasons and circumstances, is, however, necessary;

and manure should either be applied on that fallow for the first crop of wheat, or, what some people think preferable, should be laid on the wheat stubble for a crop of drilled beans, which ensures the succeeding crop of wheat. If the first crop of beans has been completely cleaned, there is no difficulty of repeating, and even of extending the course; and the crops will be little inferior to those gained at the beginning of the rotation, provided manure has been bestowed to each crop of beans. In this way, when the ground is fallowed every fourth year, two crops of wheat and one of beans are gained from manuring once; when fallowed every sixth year, three crops of wheat and two of beans are gained from manuring twice; and, when fallowed every eighth year, four crops of wheat and three of beans from manuring thrice. In the first mentioned shift, less manure is bestowed than in any of the other two; and if the soil is of good quality, it will support itself; whereas, in the shifts of six and eight, unless foreign manure is procured, it rarely happens that they can go on successfully for any length of time, without abstracting dung from other parts of the farm on which they are practised.

ON THIN CLAYS.—The rotations just mentioned are inapplicable. A six-course shift of a different kind has, however, been successfully followed by many people; but it requires every branch of the work to be well executed. *First*, a summer fallow, dunged at the rate of twelve or fourteen double loads per acre; *second*, wheat; *third*, grass; *fourth*, oats; *fifth*, pease and beans, drilled; *sixth*, wheat. If manure can be given in the middle of the shift, every one of the crops may be expected good; but if that is withheld, there will necessarily be a proportionable falling off in the two last crops. Husbandmen must, however, regulate their practice by their means; though it deserves to be remarked, that, if greater attention were paid to the collecting materials which ultimately are converted into manure, many deficiencies in the article would be fully supplied.

ON LIGHT SOILS, with the exception of *soft sands*, excellent wheat may be grown. Such soils, however, are not constitutionally disposed to the growth of that grain; nor will they, under any

management, bear such a frequent repetition of it as those already mentioned. Summer fallow on them may be safely dispensed with, because a crop of turnips, which admits every branch of the cleaning process to be more perfectly executed than even a naked or bare fallow does, may be profitably substituted. Wheat here comes in with propriety after turnips, though, in general cases, it must be sown in the spring months, unless the turnips are stored, in which case, it may be sown in November, or it may be sown after clover, for the fourth crop after the rotation, or in the sixth year, as a way-going crop, after drilled peas and beans, if the rotation is extended to that length. But, take it any way, it is scarcely possible to raise wheat so extensively upon light soils, even where they are of the richest quality, as is practicable upon clays; nor will a crop of equal bulk upon the one, return so much produce in grain as may be got from the other. To enlarge upon this point, would only serve to prove what few husbandmen will dispute, though, it may be added, that on *thin sands*, wheat ought not to be ventured, unless they are completely marled or clayed, as it is only with the aid of these auxiliaries that such a soil can gain stamina capable of producing wheat with any degree of success.

2. THE CULTURE OF THE SOIL REQUIRED FOR WHEAT.

This varies according to its nature, and the preceding and following crops. On soils really calculated for wheat, though in different degrees, summer fallow is the first and leading step to gain a good crop or crops of that grain. The first furrow should be given before winter, or so early as other operations upon the farm will admit; and every attention should be used to go as deep as possible; for it rarely happens that any of the succeeding furrows exceed the first in that respect. The number of after-ploughings must be regulated by the condition of the ground and the state of the weather; but, in general, it may be observed, that ploughing in length and across alternately, is the way by which the ground will be most completely cut, and the intention of fallowing accomplished. It has been argued, that harrowing clay soils, when sum-

mer fallowed, is prejudicial to the wheat crop; but, without discussing this point (such a discussion being unnecessary), it may merely be stated, that in a dry season, it is almost impracticable to reduce real clays, or to work them too small; and that, even in a wet one, supposing they are made surface-smooth, they will, when ploughed up again, consolidate into clods or big lumps, after forty-eight hours' drought, and become nearly as obdurate as ever. It is only on thin soils, which have a mixture of peat-earth, and are incumbent on a bottom impervious to water, that damage is at any time sustained by over harrowing. Such are generally of a weak texture, and may be broken down with facility by the roller and harrow. If caught by much rain before the pores are in some measure closed, the moisture is greedily absorbed; and being prevented from going downwards by the hardness of the subsoil, the whole surface becomes a kind of mortar or paste, unless previously well ridged up; which, to a certain extent, prevents the consequences from being dangerous. These evils, however, must be submitted to by the possessors of such soils, if they want them sufficiently fallowed and prepared in a proper manner; for, without reducing them, *couch-grass*, and especially *moor-fog*, with which they are commonly stored, cannot be eradicated. If they are reduced in the early part of the season, the danger is small; but to break them down in the latter part ought always to be avoided, unless called for by the most imperious necessity.

When wheat is sown after beans, it rarely happens, in this northern climate, that more than one ploughing can be successfully bestowed. Before ploughing, it is advantageous to cross harrow the land, which levels the drills, and permits the ploughing process to be executed with precision. Almost in every case, the ridges should be gathered up, so that the furrows may be well cleared out, and the plants preserved from injury during the inclement winter season. Clover land should be neatly ploughed and well laid over, so that the roots of the grasses may be buried and destroyed; for it frequently happens, that crops of wheat after clover and rye-grass, are greatly injured by inattention to the ploughing process. In short,

sowing wheat after clover may be considered the most hazardous way in which that grain can be cultivated.

3. ON PLOUGHING.

It is by means of ploughing that a convenient bed for the roots of the young plants, and a proper condition of the land for supplying them with due nourishment, is in a great measure provided, as well as a proper state of dryness in many cases afforded.

There are certain circumstances that constantly demand notice in the practice of ploughing land. In all the stiff, heavy, and much adhesive kinds of soils, that are much disposed to the retention of moisture, whether they be perfectly clayey, or have more of a loamy quality, it should be a common rule never to plough or turn them up when wet in any great degree, except where the nature of the crop requires it. And further, great injury is produced by the treading of the team, as well as a much greater power necessary in performing the operation. But at the same time they should not be permitted to become so dry and hard as to afford too great resistance in that way, before the operation is proceeded upon.

But in the dry, sandy, and probably in some of the more mellow and friable kinds of loamy soils, the business of ploughing, especially for the putting in of the seed, may be performed when they are in a state of considerable moisture, not only without their suffering any inconvenience, or the seed being injured, but often with advantage, as they are liable to part with the watery particles that they contain too readily. On this last account the very dry sorts of sandy land should, whenever the weather is hot and dry, merely be stirred in such a way as may be necessary to prevent the growth of weeds, otherwise the great exhalation of moisture in such seasons may render them too dry for the healthy vegetation of the seeds or plants that may be sown or set upon them.

In regard to the depth and frequency of ploughing lands, they most constantly depend, in a great measure, upon the qualities and the sorts of crops that are to be grown. But in general the different preparatory ploughings should be deeper than those of the seed furrow, which ought mostly to be light, and the silex not too much laid over, that

the seed, especially where the broadcast method of sowing is adopted, may be the more perfectly covered.

Upon all light soils, it is necessary to preserve, at six or eight inches below the surface, what farmers call a *pan*: that is, the staple, at that depth, should be kept unbroken, by which means manure will be kept longer on the top; and in dry seasons, the less depth the pan has, the less liable the corn will be to burn, provided the pan consists of earth, and not of rock, because the roots of the corn will find more moisture by striking against a body of close earth than they will in a greater depth of hollow earth, as it is evident the former preserves more moisture in dry seasons.

In regard to the frequency of ploughing or turning over ground, in order to prepare and render it suitable for the production of good crops, it is obvious there must be much difference according to the nature and condition of the soil, as well as the kind of crop that is to be grown. The stiff, clayey, loamy, and even chalky soils, will in general, stand in need of more frequent stirring, either by means of the plough, drag, or harrow, in order to separate and break down their tenacious particles, than those of the sandy or gravelly, and more light kinds, in which there is much less adhesion. Besides, where lands have been in a course of tillage for some length of time, whether they are of a clayey, loamy, or even sandy quality, they may require less frequent stirring than where the contrary is the case. And where the method of putting the seed into the ground by means of drill machines is to be had recourse to, a fine state of tilth will, in general, be indispensably necessary.

The nature of the crop, that is to be cultivated must, however, in most cases, direct the number of ploughings that may be necessary, as some demand a much finer state of tillage than others, though in most cases a well-reduced earth is favourable.

As ploughing is the most important of agricultural operations, it should be performed in a proper manner; the plough acts as a wedge separating the soil, and at the same time turning it over; but care is required in the ploughman to keep his furrows straight.

Three different points require particular attention in ploughing.—First,

the breadth of the slice to be cut; *second*, its depth; and *third*, the degree in which it is to be turned over—which last circumstance depends both upon the construction of the plough, particularly the mould-board and the care of the ploughman. *The breadth and depth of the furrow-slice* are regulated by judiciously placing the draught on the nozzle or bridle of the plough; setting it so as to go more or less deep, and to take more or less land or breadth of slice as may be desired. In general the plough is so regulated, that if left to itself, and merely kept from rolling over, it would cut a little broader, and a little deeper than is required. The coulter is also placed with some inclination towards the left or land side, and the point of the sock or share has a slight tendency downwards. *The degree to which the furrow-slice turns over*, is in a great measure determined by the proportion between its breadth and depth, which for general purposes is usually as three is to two; or when the furrow is nine inches broad, it ought to be six inches in depth. When the slice is cut in this proportion, it will be nearly half turned over, or recline at an angle of forty or forty-five degrees; and a field so ploughed will have its ridges longitudinally ribbed into angular drills or ridgelets. But if the slice is much broader, in proportion to its depth, it will be almost completely overturned, or left nearly flat, with its original surface downwards, and each successive slice will be somewhat overlapped by that which was turned over immediately before it. And, finally, when the depth materially exceeds the width, each furrow-slice will fall over on its side, leaving all the original surface bare, and only laid somewhat obliquely to the horizon. *Ploughing with the breadth and depth nearly in the proportion of three to two*, is best adapted for laying up stubble land after harvest, when it is to remain during winter exposed to the mellowing influences of frost, preparatory to sowing or turnips. *The shallow furrow of considerable width*, as five inches in depth by eight or nine wide, is understood to answer best for breaking up old leys, because it covers up the grass turf, and does not bury the manured soil. *Ploughing with the depth of the furrow considerably exceeding the width*, is a most unprofitable

and uselessly slow operation, which ought seldom or never to be adopted. *The most generally useful breadth of a furrow-slice* is from eight to ten inches, and the depth, which ought to be seldom less than four inches, cannot often exceed six or eight inches, except in soils uncommonly thick and fertile. When it is necessary to go deeper, as for carrots, and some other deep-rooted plants, a trench ploughing may be given by means of a second plough following in the same furrow. *Shallow ploughing* ought always to be adopted after turnips are eaten on the ground, that the manure may not be buried too deep; and also in covering lime, especially if the ground has been pulverized, by fallowing, because it naturally tends to sink in the soil. In ploughing down farm-yard dung, it is commonly necessary to go rather deep, that no part of the manure may be left exposed to the atmosphere. In the first ploughing for fallows and green crops, it is advisable to work as deep as possible, and no great danger is to be apprehended, though a small portion of the subsoil be at that time brought to the surface. *The furrow-slices are generally distributed into beds*, varying in breadth according to circumstances; these are called *ridges or lands*, and are divided from one another by gutters or open furrows. These last serve as guides to the hand and eye of the sower, to the reapers, and also for the application of manures in a regular manner. In soils that are strong or retentive, or which have wet close subsoils, these furrows serve likewise as drains for carrying off the surface-water; and being cleared out after the land is sown and harrowed, have the name of *water furrows*. In wet lands, furrows are sometimes drawn or dug across the ridges, for the purpose of carrying off the surface-water from hollows, these are called *cross-water furrows*. *Ridges* are not only different in breadth, but are raised more or less in the middle on different soils. On clayey retentive soils, the great point to be attended to, is the discharge of superfluous water. But narrow *ridges or stitches*, of from three to five feet, are not approved of in some of the best cultivated counties. In these, a breadth of fifteen or eighteen feet, the land raised by two gatherings of the plough, is most commonly adopted for

such soils; such ridges being thought more convenient for manuring, sowing, harrowing, and reaping, than narrower ones, and the water is drained off quite as effectually. *Ridges on dry, porous, turnip soils* may be formed much broader; and were it not for their use in directing the labourers, may be, and sometimes are dispensed with altogether. They are often thirty or thirty-six feet broad; which in Scotland are called *band-wine ridges*, because reaped by a band of sheares, commonly six, served by one binder. If it be wished to obliterate the intermediate furrows, this may be done by casting up a narrow ridgelet or single bout-drill between the broad ridges, which is afterwards levelled by the harrows. *The mode of forming ridges straight and of uniform breadth*, is as follows:—Let us suppose a field, perfectly level, that is intended to be laid off into ridges of any determinable breadth; the best ploughman belonging to the farm conducts the operation with the aid of three or more poles, shod with iron, in the following manner: the first thing is to mark off the head ridges, on which the horses turn in ploughing, which should in general be of an equal breadth, from the bounding lines of the field, if these lines are not very crooked or irregular; the next operation, assuming one straight side of the field, or a line that has been made straight, as the proper direction of the ridges is to measure off from it with one of the poles, all of them of a certain length, or expressing specific measures, half the intended breadth of the ridge, if it is to be gathered, or one breadth and a half if to be ploughed flat; and there the ploughman sets up a pole, as a direction for the plough to enter. On a line with this, and at some distance, he plants a second pole, and then in the same manner a third, fourth, &c., as the irregularity of the surface may render necessary, though three must always be employed—the last of them at the end of the intended ridge, and the whole in one straight line. He then enters the plough at the first pole, keeping the line of poles exactly between his horses, and ploughs down all the poles successively, halting his horses at each, and replacing it at so many feet distant as the ridges are to be broad; so that when he reaches the end of the ridge, all his poles are again set

up in a new line parallel to the first. He returns, however, along his former track, correcting any deviations, and throwing a shallow furrow on the side opposite to his former one. These furrows, when reversed, form the crown of the ridge, and direct the ploughmen who are to follow. The same operations are carried on until the whole field is marked out. This is called *feiring* in Scotland, and *striking or drawing out the furrows* in England. It is surprising with what accuracy these lines are drawn by skilful ploughmen. The direction and length of ridges are points which must evidently be regulated by the nature of the surface and the size of the field. Short angular ridges, called *busts* or *short work*, which are often necessary in a field with irregular boundaries, are always attended with a considerable loss of time, and ought to be avoided as much as possible.

In the choice of implements, the agriculturist should be careful that they are well suited to the nature and quality of the land, as it is not possible that any particular sort of plough can be employed with equal facility and advantage on soils of every description. The more stiff and heavy kinds of lands will require ploughs of more strength than those of the thin, chalky, and a light, sandy, or gravelly nature. The former may mostly be managed in a proper manner by any of the well-constructed kinds of strong ploughs; as the *Somerset single-wheel* plough, the *Hampshire two-wheel* plough, and the latter by those of the light sort, as the *Rotherham* plough, the *Norfolk* light two-wheeled plough, or the *double-furrowed* plough, &c. See plate, Ploughs, &c. But whatever description of plough may be had recourse to, it is a matter of the greatest consequence that it be properly formed and attached to the draught, as where these points are not minutely attended to, there must constantly be a considerable loss in the economy of labour and time, as well as in the completeness of the work.

4. ON THE VARIETIES OF WHEAT.

Of what countries wheat is a native is totally unknown, it has, however, been conjectured, and with some degree of probability, that it came originally from the hilly countries of Asia and Africa, and that it has become

hardy by time and cultivation in this and other parts of the world.

With the exception of some parts of the southern coast of Africa, wheat is cultivated in every part of the temperate and torrid zones, and in some places as high as two thousand feet above the level of the sea. It has been cultivated from time immemorial in Britain, but in few places at a greater elevation than six hundred feet. Of course the elevation at which any plant can be cultivated, always depends on the latitude of the situation.

Wheat is by far the most important of the cereal grasses, so named from the ancient tradition, that Ceres was the discoverer of these grains, they have received the general name of *Cerealia*. Wheat being subject to the severity of winter, its roots are wonderfully disposed to withstand the inclemency of that season. The first or *seminal* root, is pushed out at the same time with the germ; and that, together with the meal, nourishes the plant, until it has formed the crown. When this has become sufficiently large, it detaches a number of strong fibres, which push themselves obliquely downwards. These are the *coronal* roots. A small pipe preserves the communication between them and the *seminal* roots: it makes an essential part of the plant, and is observed to be longer, or shorter, according to the depth at which the seed has been buried. The crown, however, is always formed just within the surface, and its place is the same, whether the grain has been sown deep or superficially. As the increase and fructification of the plant depends upon the vigorous absorption of the coronal roots, it is no wonder that they should fix themselves so near the surface where the soil is always the richest.

There are several different kinds of wheat, or varieties, perhaps chiefly caused by cultivation in different soils and climates. The most important distinctions in this country are *spring* and *winter* wheats. The *winter* wheat is sown about Lammas, and germinates, and continues to make some progress in growth, even during the winter months, resisting the effects of frost. The *spring* wheat, is less hardy, weaker, and smaller grain, is supposed to have come from Syria, and is cultivated with success when sown late in the spring is

found convenient for the farmer. The advantage of this kind is, that it comes sooner to maturity, considering the period at which it is sown, than the more hardy but later winter wheat.

The produce of summer wheat, both in grain and straw, is considerably less than that of winter wheat, the straw being only fit for litter, or inferior fodder, and the flour coarser and darker than that of common wheat. It cannot, therefore, of course be recommended for general cultivation. It is a remarkable circumstance, that none of these grains can be distinctly found growing in a state of nature. They are only seen under the form of cultivation, and are, accordingly the accompaniments and indications of a certain advance of civilization among nations using them as food. In consequence of this circumstance, the native countries and climates of the several grains cannot at the present day be ascertained. There can be no doubt that long cultivation has greatly improved both their size and quality, and most probably in their original state they did not excel our common grasses. Wheat was well known to the ancient Egyptians, as grains of this substance have been discovered entire, and perfectly preserved, in some of their most ancient monuments and sepulchral depositories. The grains have always been spread, along with extending refinement and industry. A wheat grain consists of but one *seed-lobe* or *cotyledon*; and it differs thus from the pulses, such as pease and beans, or from many of our trees, as the acorn, ash, &c., whose seeds have all two halves or lobes. At one end of the wheat-grain is to be observed a small oval mark, which is the situation of the germ, from whence the leaf and roots of the plants spring: it is also at this place that the seed adheres to the head or stalk of the plant. A grain of wheat will throw out many stalks from this same point, and thus a provision is made for the attacks of insects, which often destroy the first leaf-bud, or for the depredations of birds, or other animals, that destroy a considerable portion of the whole seeds of a sown field. If the seed is deficient, and the plants come up thin, then an additional number of young shoots are thrown out to make up the vacant space.

Botanists reckon seven species of

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wheat which are, or may be, cultivated for their grain.

TRITICUM (According to Varro, was so named from its grain being originally worn down (*tritum*) in making it eatable).

Class 3. Ord. 2. Triandria Digynia. Nat. Ord. Gramineæ.

Characters are—*Glume two valved, many-flowered, shorter than the spikelet; the valves nearly equal, beardless, or with one beard enclosing the florets. Paleæ two, one of them being bearded from the end. Seed enclosed in the paleæ, rarely otherwise.*

1. TRITICUM ÆSTIVUM (summer or spring wheat). *Glumes gibbous, bearded, truncated at base, contracted, with a nerve running upwards.*—The grain is rather longer and thinner than the common wheat. The stalk, straw, or culm, as Linnæus calls it, is three feet high at a medium, jointed, cespitose, or in tufts; seventy-two have been known to issue from one root. The farmers call it spring wheat, because it will come to the sickle with the common wheat, though it should be sown in February or March; but, although a speedy, it is an uncertain crop. We have never seen an authentic specimen, nor are we at all certain that what has generally been taken for this species is any thing more than a variety of the *hybernium*.

2. TRITICUM TURGIDUM (thick spiked or cone wheat). *Glumes obtuse, silky, or villous.*—The grain is shorter, plumper, and more convex on the back than the *æstivum*. Its varieties are numerous, and have various appellations in different counties, owing to the great affinity of several of them. The most common are:—*First*, white cone wheat; *second*, red cone wheat; *third*, bearded cone wheat; and *fourth*, cone wheat, with many ears. The third variety is what the farmers call clog wheat, square wheat, and rivets. The grain of this is remarkably convex on one side, and, when ripe, the awns generally break in pieces and fall off. This sort is very productive, but it yields an inferior flour to that of the former.

3. TRITICUM POLONICUM (Polish wheat). *Glumes furnished with very long aristæ.*—It was cultivated here in the latter part of the seventeenth century, for curiosity, at least, and is still seen in botanic gardens, though not much regarded by the farmers, be-

ing easily laid by rain. That it is a distinct species there can be no doubt.

4. TRITICUM COMPOSITUM (Egyptian or many spiked wheat). *Glumes smooth, awns three or four inches long.*—It is cultivated in few places in England, and is in little estimation.

5. TRITICUM SPELTA (Spelt or German wheat). *Glumes very glaucous.*—It is chiefly cultivated in the south of Europe and is given to horses in Spain, when barley is scarce. The grain is light, and yields but little flour; which, however, is said to contain a larger portion of gluten than the *hybernium*, and, for that reason, it is recommended as superior to any other in pastry and confectionery.

6. TRITICUM MONOCUM (St. Peter's corn, or one-grained wheat). *Glumes three-toothed.*—The spike is shining, and has two rows of grain in the manner of barley, but they are shaped like wheat. This species is much cultivated in the most mountainous parts of Switzerland. The neat quadrangular form of the ripe ear, as if carved out of ivory, is remarkable. The *straw* is hard and firm, excellent for thatching, and the flour rather better than the *Spelta*, in conjunction with which it is there made into bread. It is coarse, and not so nourishing as that made of common wheat, and is chiefly esteemed for gruel.

7. TRITICUM HYBERNUM (winter, common or Lammas wheat). *Glumes gibbous, truncated, contracted at base, smooth; the outer ones, near the top of the spike, are often tipped with short aristæ.*—The grain is rather plumper than the *æstivum* and is the sort most generally sown in England; whence the name of *common wheat*. Its varieties are very numerous. Professor Thaer speaks of above one hundred, but the most permanent are the red and white grained, and the spring wheat, which is generally red. The Hertfordshire reds and whites, woolly eared, awned, &c., are so many subvarieties of the red and white. Wheat answers best when treated as a biennial, though it does not remain above one year in the ground.

The uses of wheat are well known. The grain yields a greater proportion of flour than every other; for, whilst fourteen pounds of barley will yield twelve pounds of flour, and of oats, eight pounds; the same quantity of wheat yields thirteen pounds. It is also more

nutritive, one thousand parts of barley yielding nine hundred and twenty, of oats seven hundred and forty-three, and of wheat nine hundred and fifty-five soluble parts. Of these the gluten of wheat is ninety, of barley, sixty, and of oats eighty-seven. Gluten is so essential an ingredient in bread, that the panary fermentation cannot go on without it, and hence the inferiority of that article in wet seasons, when wheat is blighted or ill-ripened, and the advantage of having a stock of old grain, or of grain from the south of Europe, especially of the Mediterranean isles and coasts.

Wheat starch is made from wheat, by steeping it, and afterwards beating it in hempen bags. The mucilage, being thus mixed with the water, produces the acetous fermentation, and the weak acid thus formed renders the mucilage white. After settling, the precipitate is repeatedly washed, and then formed into square cakes. In drying, the cakes separate into flakes, in which state it is sold in the shops. Starch is soluble in hot water, but not in cold; and hence, ground down, it makes an excellent hair powder. Its constituents are carbon 43.55; oxygen 49.68; hydrogen 6.77, equal to 100.

The straw of wheat from dry chalky lands is manufactured into *hats*, for which purpose, the middle part of the tube above the last joint is taken, and being cut into lengths, of eight or ten inches; these pieces split in two are used to form the plait. The operation of plaiting is performed by females and children, who plait it into ribbands of from one to two inches broad, and these are afterwards sewed together on blocks or moulds, beginning at the crown, in various shapes according to fancy or fashion. *The best straw* is produced on the chalky soil about Dunstable, where plaiting is a common occupation. Other grasses afford culms which have also been used and manufactured into much finer and more expensive work than those of wheat or rye. Leghorn hats are made from the straw of a bearded variety of wheat not unlike rye. It is grown on poor sandy soils on the banks of the Arno, between Leghorn and Florence, expressly for this manufacture. It does not grow above eighteen inches in length, is pulled green, and bleached like flax, on the gravelly bed of the

river. The straws are not split as in England, which renders the plait tougher and more durable. *The value of wheat-straw for thatching*, litter and other purposes, need not be mentioned.

The English counties most distinguished for the quantity, as well as the quality of their wheat, are Kent, Essex, Suffolk, Rutland, Herefordshire, Berkshire, Hampshire, and Hertfordshire.

In the best wheat counties, and in good years, the weight of a bushel of wheat, eight gallons to the bushel, is from sixty to sixty-two pounds. In the Isle of Sheppey, in Kent (where perhaps, the best samples of wheat, sent to the London market are produced), this grain, in favourable seasons, weighs sixty-four pounds.

To judge of a sample of wheat, observe if the grain be perfectly fed or full, plump, and bright, and if there be any adulteration, proceeding from sprouted grains, smut, or the seeds of weeds; by the smell also may be discovered whether there is smut, or if the wheat has been too much heated, either in the mow or on the kiln; by handling also it may be ascertained whether it is sufficiently dry for the miller or the baker. If it handles rough it is an indication of not being fit for the miller, or of laying up for keeping.

In order to procure new varieties, the most systematic mode is by crossing two sorts, that is, by impregnating the female organs of the blossoms of one ear with the fecundating matter, or pollen of the male organs of the blossoms of another variety of a different quality. Thus if a farmer was in the habit of cultivating a good variety, and wished to render it earlier, he should procure in the blooming season, from a very early soil, some spikes of an early sort, just coming into blossom; put the ends of these in water, and set them in the shade, so as to hinder their fully blossoming until the plants he has destined to become the females, come into flower. All the male organs of the latter must be cut out before they have so far advanced as to impregnate the stigma. When this is done, the stigma must be dusted with the blossoming ears of the early male parent. The impregnated stalks must be then kept apart from other wheat, that the pro-

gony may be true. When the grains ripen, let him sow the best; and from the produce, select the earliest and finest spikes for seed. Let him sow these and repeat the choice until he procures a bushel or two of seed.

5. OF THE WAY IN WHICH WHEAT IS SOWN.

Sowing in the *broad-cast way* may be said to be the mode universally practised in North Britain. There are, however, other modes adopted in South Britain, such as *drilling*, *ribbing*, or *dibbling*. When wheat is broad cast, it is harrowed in; this is thought not to thrive so well, and therefore many farmers adopt the practise of *ploughing-in*. The defect in crops where broad-casting is used, is supposed to arise from the land having not been sufficiently ploughed, and thus not leaving sufficient earth to cover the seed when it is harrowed in. To guard against this evil, and to cause the wheat to thrive better, it is a common practice in most of the southern counties, when wheat is sown broad-cast, to plough it in with a shallow furrow. This is done even after beans, and on clover leys; and is practised upon very opposite kinds of soil in Norfolk and Middlesex.

Drilling is extensively practised; and is becoming more general on lands where annual weeds prevail, especially when the sowing is in spring. A machine which sows at three different intervals, according to the judgment of the farmer, of twelve, ten and a half, or nine inches is much approved of in the North. It deposits six, seven, or eight rows at once, according to its adjustment to one or other of these intervals, and the work is done with ease and accuracy when the ridges are previously laid out of such a breadth (twelve feet and a half) as to be sown at one bout; the machine going along one side of such a ridge, and returning on the other, and its direction being guided by one of its wheels; which always thus runs in the open furrow between the ridges.

The space between the rows varies in some parts; it must, however, be of sufficient width to admit of hand-hoeing, even after the crop has made considerable progress in growth.

Ribbing.—In practising this mode the seed is scattered by the hand in the

usual broad-cast manner; but it necessarily falls mostly in the furrows between the ribs; the crop rising in straight parallel rows, as if had been sown by a drill machine; after sowing, the ribs are levelled by harrowing across them.

The dibbling of wheat is practised in some parts of Norfolk. Holes are made by the dibbler, who carries a dibble in each hand. One dibbler is sufficient for three droppers of grain into the holes. Two or three grains are put into each hole. This mode will save seed, and to be attended with some other advantages; but it is said, that when wheat is dibbled, a large crop of weeds grows up with the wheat, and therefore, upon the whole, some judicious farmers, think that dibbling of wheat is not really a profitable practice.

The culture of summer wheat differs from that of winter, or spring-sown winter wheat, in its requiring a more minutely pulverized, and rather richer soil. It need not be sown sooner than April, and it advances so rapidly to maturity, that it hardly affords time for hoeing (if sown in rows), or harrowing and rolling. When grass and clover seeds are sown on the same ground, they are sown immediately after the wheat, and harrowed in with a light harrow, or rolled in. In this respect, and indeed in all others, the preparation of the soil and growing of this grain, are the same as for barley.

6. OF PICKLING THE SEED, SO THAT IT MAY BE PRESERVED FROM BEING SMUTTED OR BLACKED.

This process is indispensably necessary on every soil, otherwise smut, to a greater or less extent, will, in nine cases out of ten, assuredly follow. Though almost all practical farmers are agreed as to the necessity of pickling, yet they are not so unanimous as to the *modus operandi* of the process, and the article which is best calculated to answer the intended purpose. *Stale urine* may be considered as the safest and surest pickle; and where it can be obtained in a sufficient quantity is commonly resorted to. Farmers, however, are not unanimous in their opinion respecting the mode of applying it. Some are for steeping the seed in the urine, others think sprinkling it with urine is

sufficient. Some are advocates for a *pickle made of salt and water sufficiently strong to buoy up an egg*, in which the grain is to be thoroughly steeped.

The farmers resident upon some of the small islands in the British Channel, have proved the utility of steeping their seed-wheat in *sea-water*, and then mixing the grain with lime. But, however men may differ as to the kind of pickle that ought to be used, and the mode of using it, it is universally allowed that the wetted seed must be mixed with hot lime fresh slaked; and this seems absolutely necessary to prevent insects from devouring the seed. Experience justifies the use of all these modes, when they are properly attended to. There is some danger from the *first*: for, unless the seed steeped in urine be immediately sown it will not grow. The *second*, viz. sprinkling, appears to be safer if judiciously performed, and the last is equally good if the brine be sufficiently strong. The last mode is sometimes accompanied by smut, if the pickle is not sufficiently strong, but smut is rarely seen when urine has been used.

Francis Bauer, Esq. a gentleman who has attained a most deserved celebrity for his valuable discoveries connected with the diseases of grain, "recommends, as the best and surest remedy, to *steep the seed-wheat in properly prepared lime-water*, leaving it to soak, at least twelve hours, and then to dry it well in the air before sowing it. Steeping and properly drying the seed corn in the above manner, prevents the clean seed from infection. The cleanest sample should be steeped, as well as the most notoriously infected.

A *new mode of preparing wheat for sowing* has recently been adopted in the south of Scotland, and followed with great success. It is thus described:—"Take four vessels, two of them smaller than the other two, the former with wire bottoms, and of a size to contain about a bushel of wheat, the latter large enough to hold the smaller within them. Fill one of the large tubs with water, and putting the wheat in the small one, immerse it in the water, and stir and skim off the grains that float above, and renew the water as often as is necessary, until it comes off nearly quite clean. Then raise the small vessel in which the wheat is

contained, and repeat the process with it in the other large tub, which is to be filled with stale urine, and in the mean time wash more wheat in the water tub. When abundance of water is at hand, this operation is by no means tedious; and the wheat is much more effectually cleansed from all impurities, and freed more completely from weak and unhealthy grains, and seeds of weeds, than can be done by the winnowing machine. When thoroughly washed and skimmed, let it drain a little, then empty it on a clean floor, or into the cart that is to take it to the field, and sift quick-lime upon it, turning it over and mixing it with a shovel until it be sufficiently dry for sowing.

7. DISEASES OF WHEAT.

The diseases of wheat are the rust, smut, or black mildew, the latter including what is vulgarly called blight. *The proximate cause of smut* appears to be the infection of the seed by the dust of the smut-ball. Smut, however, will never prevail in any great degree, if the pickling of the grain, which has been already described, be properly attended to.

Mildew is a much more destructive distemper than smut; and as it is probably occasioned by a peculiar state of the atmosphere, during the periods of flowering and ripening, it is out of the power of man to prevent it; fogs, mists, drizzling rains, and sudden changes in the temperature of the atmosphere, have been assigned as the causes of mildew.

The wheat fly has of late years been very destructive to the wheat crops in Scotland. The colour of this fly is orange; its wings are transparent and change colour according to the light in which they are viewed. The amount of the loss in the *Carse of Gowrie* by the wheat fly alone is thus estimated. In 1827, at 20,000*l.*; in 1828, at 30,000*l.*; and in 1829, at 36,000*l.* It appears that it is only on the plant of wheat that this fly will deposit its eggs.

It cannot be improper in this place to remark, that although the *seeds* of wheat are rendered, by the exhausting power of the fungus, so lean and shrivelled, that scarcely any flower fit for the manufacture of bread can be obtained by grinding them, these seeds will, except, perhaps, in the very

worst cases, answer the purpose of seed-corn as well as the fairest and plump-est sample that can be obtained, and, in some respects, better; for as a bushel of *much blighted* corn will contain one-third, at least, more grains in number than a bushel of plump corn; three bushels of such corn will go as far in sowing land, as four bushels of large grain.

The *use of the flour* of corn in furthering the process of vegetation, is to nourish the minute plant from the time of its development till its roots are able to attract food from the manured earth; for this purpose, one-tenth of the contents of a grain of good wheat is more than sufficient. The quantity of flour in wheat has been increased by culture and management, calculated to improve its qualities for the benefit of mankind, in the same proportion as the pulp of apples and pears has been increased by the same means, above what is found on the wildings and crabs in the hedges.

It is customary to set aside or to purchase for seed-corn, the boldest and plumpest samples that can be obtained; that is, those that contain the most flour, *but this is an unnecessary waste of human subsistence; the smallest grains*, such as are sifted out before the wheat is carried to market, and either consumed in the farmer's family or given to his poultry, will be found by experience to answer the purpose of propagating the sort whence they sprung, as effectually as the largest.

Every ear of wheat is composed of a number of cups placed alternately on each side of the straw; the lower ones contain, according to circumstances, three or four grains, nearly equal in size, but towards the top of the ear, where the quantity of nutriment is diminished by the supply of those cups that are nearer the root, the third or fourth grain in a cup is frequently defrauded of its proportion, and becomes shrivelled and small. These small grains which are rejected by the miller, because they do not contain flour enough for his purpose, have, nevertheless, an ample abundance for all purposes of vegetation, and as fully partake of the *sap* (or *blood*, as we should call it in animals), of the kind which produced them, as the fairest and fullest grain that can be obtained

from the bottoms of the lower cups by the wasteful process of beating the sheaves.

8. ON HARVEST MANAGEMENT.

It is advantageous *to cut wheat before it is fully ripe*; but, in ascertaining the proper state, it is necessary to discriminate between the ripeness of the straw and the ripeness of the grain; for, in some seasons the straw dies upwards, under which circumstances a field to the eye may appear to be completely fit for the sickle, when in reality the grain is imperfectly consolidated, and perhaps not much removed from a milky state. Though it is obvious that under such circumstances, no further benefit can be conveyed from the root, and that nourishment is withheld the moment the roots die; yet it does not follow, that grain so circumstanced should be immediately cut; because, after that operation is performed, it is in a great measure deprived of every benefit from the sun and air, both of which have greater influence in bringing it to maturity, so long as it remains on foot, than when cut down, whether laid on the ground, or bound up in sheaves. The state of the weather at the time also deserves notice, for in moist, or even variable weather, every kind of grain, when cut prematurely, is more exposed to damage than when completely ripened.

All these things will be studied by the skilful husbandman, who will also take into consideration the dangers which may follow, were he to permit his wheat crop to remain uncut till completely ripened. The danger from wind will not be lost sight of, especially if the season of the equinox approaches; even the quantity dropped in the field, and in the stack-yard when wheat is over ripe, is an object of consideration. Taking all these things into view, it seems prudent to have wheat cut before it is fully ripe, as less damage will be sustained from acting in this way than by adopting a contrary practice.

If the weather be dry and the straw clean, wheat may be carted to the stack yard in a few days; indeed, if quite ripe, it may be stacked immediately from the sickle, especially when it is not intended to thresh it immediately.

So long, however, as any moisture remains in the straw, the field will be found to be the best stack-yard; and

where grass or weeds of any kind are mixed with the crop, patience must be exerted until they are decayed, and dried, lest heating be occasioned, which independent of the farmer is a most disgraceful affair.

When the wheat is carried to the stack yard, the stacks may be built, either in oblong or circular forms. It is usual to build the stacks upon frames supported by stone pillars to keep them from vermin, and the bottom of the stacks from becoming damp. In wet harvest weather, when there is danger of the stacks being heated, it is usual to make funnels through them; a large one in a perpendicular direction, and small lateral ones to communicate with it. Corn is less exposed to damage of any kind in well built stacks than when housed in barns. The stacks should, however, be properly thatched, as soon as possible, after they are built.

9. ON THRESHING WHEAT.

The threshing of wheat, before the introduction of machinery, was both expensive and very laborious for the thresher, particularly in unfavourable seasons, for then the grain adheres so close to the ear that it is very difficult, and extremely hard work to beat it out with the flail. This was not only expensive to the farmer, but much of the grain was unavoidably lost. It is now, however, by means of a machine, threshed much cleaner, and at much less expense.

In using the threshing-machine, one man feeds the grain in the straw into the machine, assisted by two half-grown lads or young women, one of whom carries the sheaves close to the threshing stage, whilst the other opens the bands of the sheaves, and lays them successively on a small table, close by the feeder, who spreads them evenly on the feeding-stage, and they are drawn in successively by the fluted rollers, to undergo the operation of threshing. A man is employed to fork up the threshed straw from the floor to the straw mow, and two lads, or young women, build it and tread it down. A machine will thresh from two to three hundred bushels of grain in nine hours, and at a very small expense; so that the threshing, dressing, and building of the straw, with the use of a powerful mill, scarcely costs more than dressing

alone when the flail is employed. If the machine be worked by horses, the expense will be considerably increased: a large machine will require eight good horses to work it, and a man and boy to drive the horses. Thus to thresh two hundred and fifty bushels of wheat, would cost 2l. 2s. 6d., or about twopence per bushel, when the wages of attendants are added, still leaving a considerable difference in favour in point of expense by threshing with the machine instead of the flail. Machines are sometimes made by ingenious mechanists, and let out for hire, at the rate of seven or eight shillings per week, to those farmers who cannot afford to buy them.

ON RYE.

SECALE (an ancient name, supposed to have been derived from *seco*, to cut, which word is said to have been formed from the Celtic *sega*, a sickle).

Class 3, 2. Triandria Digynia. Nat. Ord. Gramineæ.

The characters are—*Glumes subulate, opposite, entire, shorter than the florets.*

1. SECALE CEREALE (common rye). *Glumes and beard rough; paleæ smooth, toothed at the end.*—Rye is a culmiferous plant, much more generally cultivated in Britain in ancient than in modern times; being only partially used in certain districts, for making bread, or in the distillation of spirits. It is a species of wheat, capable of being cultivated on most kinds of land, but the light sandy soils that cannot well be converted to the purpose of wheat or barley, are probably those on which it can be grown in Britain to most advantage, as its produce and value are inferior to that of other kinds of corn. It is, therefore, generally sown only upon lands which cannot be turned to better account. Even upon some very poor sorts of sandy soil wheat is supposed to yield a more valuable crop than rye, the quality of the land being the same. It is usual to sow it after early fed turnips, clover, pease, &c., and sometimes after naked fallows.

The land upon which it is sown should be floury or pulverized. When it is intended to stand for a crop, it is customary to sow it upon a fallow; and if it is to be eaten off by sheep, one ploughing is generally sufficient; the land being broken up

and fallowed for turnips immediately that the crop has been sufficiently eaten down by the sheep. *The periods of sowing rye* are nearly the same as those of wheat; but, when it is intended for green food, it should be sown in August or September. In particular cases, where the early sowings have failed, it may be sown in October, or the winter months, until the beginning of March, where a succession of green crops is intended for the feeding of sheep. *The quantity of seed*, when the crop is intended for harvesting, is usually, from two bushels to two and a half per acre; but three bushels or more will be necessary when the crop is intended to feed sheep; as in these cases the plants should stand thicker upon the ground, that the largest possible quantity of green food may be provided. *The process of germination* is rather slow, therefore the seed should be tolerably dry, or it will be likely to perish, especially in a wet season. If the crop, intended for harvesting, should be very luxuriant, early in the spring, it may, at the beginning of March, be eaten off by sheep. This, however, must be done early, or it may destroy the new formed ear. In the southern counties of England, rye is often cultivated for the use of tanning leather; but, more frequently as a green crop for sheep, in the spring before the turnip crops are ready. If not fed down in February, or early in March, it will not yield much after the first feeding off, as the stem becomes firm and sticky. In a very mild season, the sheep may be turned in to feed before February, and continued until April. *The after culture, harvesting, and threshing*, are the same as for wheat.

ON THE DISEASES OF RYE.—*The spur or ergot of rye*, is by some considered as a fungus, a species of *Sclerotium*, somewhat analogous to that which produces the smut. It is not peculiar to rye, but is very seldom found on any other gramineous plant. It is a production of the seeds, is long, horny, and cartilaginous, and is sometimes straight, but at other times curved, and grows to the length of more than two inches. The resemblance of this substance to *cockspurs* has given it the name by which it is distinguished. On breaking a spurred seed, you find within it a substance of a dull white colour, adhering to the violet skin that surrounds

it. Rye thus attacked cannot germinate. In the most rainy seasons this disease prevails more than in the dry; and the soils on which it grows the most are moist. The eating of diseased rye sometimes affects animals with a chronic disease. It also affects human beings if they continue for a length of time to eat bread made from it. The chronic disease, called the dry gangrene, is produced also from eating bread made of damaged wheat. The ergot is covered with a thin pellicle and filled with a gray powder. In Spain, it is collected by women and children, who wade in the fields of standing rye for the purpose, and with their utmost vigilance can obtain it but in small quantities. It sells high as an article of the *Materia Medica*, and is used medicinally in uterine diseases.

ON BARLEY.

HORDEUM (Bodæus a Staple, derives the word from *hordus* heavy, because bread made with barley is very heavy. *Bara* is the Celtic for bread, whence our English words, barn and barley; as beer is a slight alteration of the appellation of barley in that tongue, *bere*.)

Class 3, I. Triandria Digynia. Nat. Ord. Gramineæ.

The characters are—*Spikelets one-flowered, three together, the two lateral often barren; glumes two, subulate; paleæ two, the lower bearded; scales two; stigmas feathery.*

1. **HORDEUM HEXASTICHON** (winter barley). *All the florets hermaphrodite, bearded; seeds in six rows.*—Hexastichon (ἕξ six, ἑκστής row), signifies grain growing in six rows, and is the *bear* or *bigg* chiefly cultivated in the North of Scotland, and in Denmark and Sweden, on account of its hardness; but from the thickness of its rind it is ill adapted for malting, and is going out of use.

2. **HORDEUM DISTICHON** (common barley). *Lateral florets male, beardless; hermaphrodite in two rows, bearded.*—It has thin husks, and is preferred for malting, for which purpose it is cultivated in many parts of England, and Scotland. From this species the *pearl-barley* of the shops is said to be principally prepared. Some farmers object to this sort, because they say the ears being long and heavy, it is apt to lodge.

3. **HORDEUM ZEOCRITON** (battle-dore or sprat barley). *Spike short; seeds angular, spreading.*—Zeocriton is derived from ζῆα, which is supposed to have been *spelt*, and *κῖτρον* barley; that is to say, barley resembling *spelt-wheat*. It has short broad ears, long awns, and short coarse straw.

4. **HORDEUM VULGARE** (common spring barley).—*All the florets hermaphrodite, bearded; seeds in double rows, very upright.*—It is an annual plant, and is said to have been found wild in Sicily and Russia. Of the *common spring barley*, which is the sort principally cultivated in England, the farmers make two sorts, namely, the *common* and *rath-ripe barley*, which however are the same; for the *rath-ripe* is only that which has been long cultivated upon warm gravelly lands. The seed of this, when sown in a cold or strong land, will the first year ripen, near a fortnight earlier than the seeds taken from strong land, therefore the farmers in the vales generally purchase their seed barley from the warm land; for if saved in the vales two or three years, it will become full as late in ripening as the *common barley* of their own product; and the farmers on the warm lands are also obliged to procure their seed barley from the strong lands, to prevent their grain from losing its bulk and fullness. *New varieties* may be procured by selection or crossing, as in the case of wheat.

It was cultivated by the Romans as a *horse-corn*, and also for the army, and the gladiators were called *Hordiarii*, from their feeding on this grain. In the south of Europe, they have sometimes two crops, in one season, one sown in autumn, and cut in May, and another sown in spring, and cut in autumn. In Lapland two months, and in England nine weeks elapse between the sowing and cutting of this grain. *Malt* is the chief purpose for which barley is cultivated in Britain, but it is also made into *flour* and *pot* and *pearl-barley*. To understand the process of malting, it must be observed that the cotyledons of a seed, before a young plant is produced, are changed by the heat and moisture of the earth into mucilage and sugar; and that malting is only an artificial mode of effecting this object, by steeping the grain in water, and fermenting it in

heaps, and then arresting its progress towards forming a plant, by kiln-drying, in order to take advantage of the sugar in distillation for spirit, or fermentation for beer. In malting, a part of the mucilage or starch is converted into sugar, and thus the source of the spirit is increased. The employment of this grain for the purpose of producing a fermented drink, appears to have been well known to the Egyptians, Greeks, Saxons, and most of the nations of antiquity. In Britain, at the present day, there are about 30,000,000 bushels of barley converted into malt. Of *pot-barley*, there are two sorts, *pearl* and *Scotch*, both produced by grinding off the husk, and the former varied by carrying the operation so far as to produce roundness in the kernel. It is used in soups, gruels, and medicinal drinks. *Barley-flour* is ground like flour, and forms a light pudding or pottage, which spread out in thin cakes, and slightly toasted, forms a breakfast bread, much esteemed in some parts of Scotland. It is brought to table hot from the baking plate, and eaten with butter and honey, or cream and sugar. The grain of barley contains starch and sugar; and the chemical constituents of both these ingredients are very nearly alike. In the process of malting, a portion of the starch is converted into sugar, and consequently the source of spirit is increased by the transformation. The produce of barley in flour is twelve pounds to fourteen pounds of grain. Sir H. Davy found one thousand parts of barley-meal to afford nine hundred and twenty parts of soluble or nutritious matter, namely, seven hundred and ninety of mucilage or starch, seventy of sugar, and sixty of gluten.

ON THE CULTIVATION OF BARLEY.—Next to wheat the most valuable grain is barley, especially on light and sharp soils. The immense taxation upon it, when made into malt in the first instance, and afterwards when brewed or distilled into ale or spirit, has prevented it from being so extensively cultivated as it would otherwise have been, if these imposts did not exist. The small quantity used for bread-corn, has also contributed to prevent its extensive growth. It is a tender grain, and easily hurt in any of the stages of its growth, particularly at seed-time; a heavy shower of rain then will almost ruin a

crop on the best prepared land. The harvest process is difficult, and the threshing not easily executed, on account of the close adherence of the awn to the grain, and thus rendering the separation from the straw a troublesome task. *The best soil for barley is a light rich loam, finely pulverized.* It will neither grow well on a sandy or a soft soil, nor on strong clays, such as are suitable for wheat. *The preparation of the soil is generally by a turnip fallow; but sometimes by a naked fallow.* It may be sown also after pease and beans. *The modes of sowing barley are either broad-cast, or in rows by the drill.* It is generally supposed that a greater quantity of seed is necessary for poor land than for rich; and this supposition is absurdly acted upon by many, as it cannot be reasonably imagined that a poor soil will nourish twice as many roots as a rich one. Where the roots stand close they will necessarily deprive each other of nourishment. The truth of this may be proved by observing that part of a field where the corn happens to be scattered on sowing it, and those places where by harrowing the seed is drawn up into heaps; the latter will starve, and never grow to a third part of the size to which they attain, wherever the seed happens to have been loosely sown; yet common as this is, farmers seem not to be aware of it, or surely they would not continue their old mode of sowing.

In Norfolk, after wheat-sowing, the farmer begins to scale in his wheat-stubbles for a winter fallow. If the land lie in narrow work, the ridgelets are split; if the ground is in warps, it must be ploughed clean, but very fleet. At the beginning of March the land is harrowed; soon after, the wheat-stubbles are taken up by a full pitch-cross ploughing; if, however, the season is wet, and the soil heavy, he reverses the ridges. In April harrowing, and another full pitch ploughing lengthwise into five pace or ten pace warps, in which it lies until seed-time, when it is harrowed, rolled, sown, ploughed fleet, reversing the warps, and *slading* down the furrows, so as to make the entire surface quite even and level. When barley is sown after turnips, the soil is generally broken up as fast as the turnips are taken off; if early in

winter, by rice baulking; if late, by a plain ploughing. In general, in the county of Norfolk, where good crops of barley are grown, three ploughings are used after turnips.

In Essex, five ploughings are adopted; four in the fallow-year, leaving the land in ridges for winter by the fourth ploughing. Then, in hard frosts, they put manure upon the land, to the amount of twenty or thirty loads to an acre—farm-yard dung mixed with turf. Sowing is practised from the last week of February to the middle of April; but if the seed is not in the ground in March a good crop is not expected.

Barley is ripe when the red roan, as the farmers term it, meaning a reddish colour on the ear is gone off, or when the ears droop and fall, as it were, double against the straw, and the stalks have lost their verdure; but in the latter case it is too ripe. *In the harvesting of barley more care is requisite than in taking any of the other white crops, even in the best of seasons; and in bad years it is often found very difficult to save it.* Owing to the brittleness of the straw, after it has reached a certain period, it must be cut down; as when it is suffered to stand longer, much loss is sustained by the breaking of the heads. On that account it is cut at a time when the grain is soft, and the straw retains a great proportion of its natural juices, consequently it requires a long time in the field before the grain is hardened, or the straw sufficiently dry. When put into the stack sooner, it is apt to heat, and much loss is frequently sustained. *Barley is generally cut down in England with the cradle scythe, and carted home after lying loose in the swath some days.* It will not easily shed, but in wet weather it will sprout or grow musty, and, therefore, every fair day it should be shaken up and turned; but should never be housed until it is thoroughly dry, as it may become mow-burned, which will make it malt worse than if it had spired in the field. *In stacking barley an opening is often made in the stack, from the top to the bottom.* This is done by placing a large bundle of straw in the centre of the stack, and drawing it upwards as the stack rises in height; thus a free circulation of air is preserved, and the grain prevented from becoming musty.

ON OATS.

AVENA (a name of obscure origin. De Theis thinks it has been derived from the Celtic word *aten*, which comes from *etan*, to eat; and whence our common word ait, oat, has been obtained).

Class 3, 2. Triandria Dyginia. Nat. Ord. Gramineæ.

The characters are—*Glumes membranous, 2-7 flowered, longer than the florets; scales ovate; seed, coated, furrowed.*

1. AVENA SATIVA (common cultivated oat). *Panicle equal; spikelets two-flowered, florets smaller than glumes at the base, naked, one-bearded; root fibrous.*—The cultivated oat has an annual root. Culm, or straw, two feet high and upwards. There are usually two flowers and seeds in each calyx: they are alternately conical, the smaller one is awnless, the larger puts forth a strong, two-coloured, bent awn from the middle of the back; both are cartilaginous and fertile.

After wheat, rye, and barley, *oats* have been considered as of very great importance, and a valuable grain. It has, however, a considerable degree of roughness, and is harsh and unsuited to very delicate constitutions; but this very harshness from its stimulating effect, producing a feeling of warmth in the stomach, renders it more grateful to persons much exposed to the open air, and accustomed to hard labour, who find in it a hearty kind of food. In an agricultural point of view, it is only calculated for cold climates. In Italy and France, and even in the southern counties of England, the ears are small and husky, and afford little meal; the panicles open, and the foot stalks of the ears small; and in July and August the heat dries them up, and obstructs the progress of the sap to the grain. On the other hand, this naked *panicle* is better for drying after rains and dews than the close spikes of wheat and barley, which, while they serve to guard the ears from the extremes of heat in warm climates, are apt to rot or become mouldy (covered with fungi) in cold moist countries or seasons.

In Scotland, *oatmeal* is a common food of the peasantry in the present day; and in former periods, both oats and barley were generally so used. As a test of modern improvement in the general condition of the people, how-

ever, it may be mentioned, that now even the labouring classes, for the most part, partake of wheaten bread. Oats are a very profitable grain, and esteemed the most wholesome food for horses, being sweet, and of an opening nature; other sorts of grain are apt to bind, which is injurious to labouring horses; but if they be fed with this grain, soon after it is housed, before it has had a sweat in the mow, or been otherwise dried, it is as bad on the other hand, for it is then too laxative. This grain is a great improvement to many estates in the north of England, Scotland, and Wales; for it will thrive on cold barren soils, which will produce no other sort of grain: it will also thrive on the hottest land; in short, there is no soil too rich or too poor, too hot or too cold, for it; and in wet harvests, when other grain is spoiled, this will receive little or no damage; the straw and husks being of so dry a nature, that if they be housed wet, they will not heat in the mow, or become mouldy, as other kinds of grain usually do; it is, therefore, of great advantage in the northern parts of England, and in Scotland, where their harvest is generally late, and the autumns wet.

Of this grain there are more varieties than of any other of the culmiferous tribe. The varieties consist of the common oat, the *Angus* oat, an improved variety of the other; the *Poland* oat, the *Friesland* oat, the *red* oat, the *dun* oat, the *Tartar* or *Siberian* oat, and the *potato* oat. The kinds called *Poland* and *potato* seem best adapted for rich soils; the *red* oat for late climates; and the other kinds for the soils generally, of which the British isles are composed. The *Tartar* or *Siberian* kind is hardy and prolific, but is seldom used on account of its coarseness and the scanty quantity of meal which it yields. The *dun* oat also is seldom sown. The *potato* oat has nearly superseded the use of the *Poland* and *Friesland* oats; it being considered of superior value in all respects, when sown upon good soil and properly cultivated. *Less preparation is required for oats than for any other kind of grain.* It is generally the first crop upon lands newly broken up by the plough; or oats may be sown after wheat or barley. *The soil must not be too finely pulverized.*

The best crops in quantity and quality are those sown after grass.

The author of *Practical Agriculture* has remarked, "there can, indeed, be little doubt, that by the lands undergoing a more full and complete preparation than is usual for this crop, the quantity of produce may be greatly increased, as the fibrous roots of the plants are better enabled to extend themselves in the loose earth, and thereby to afford a more perfect support to the plants. In some cases, as where the land has been much reduced and exhausted by the previous crops, or in breaking up thin poor soils, where the proportion of turfy material is considerable, and when the prices of other sorts of grain are low, it may be advantageous to have recourse to the use of manure, as it is probable that by such means a third more produce might at least be obtained."

The time for sowing oats is from the end of February to the end of April, although the best farmers prefer the middle of March. *The seed needs no preparation*; it should, however, be of good quality, fresh and free from the seeds of weeds.

If oats are sown in autumn the winter will kill them, this grain being more tender than wheat or barley. *If they are sown broad cast*, from four to six bushels of seed should be used to the acre. *Potato oats require less seed* than any other kind, because they tiller better, and having no awn, there are more grains in a bushel. *The general mode of sowing* is broad cast, but where they are sown after turnips, or on other well pulverized soils, some farmers adopt the *row culture*. *The after culture* depends on the mode of sowing, but it is only weeding that is in a general way required before the flower stalks begin to shoot up. *In harvesting oats in England*, they are generally cut down with the *scythe*, and carried loose to the barn or stack; but in the north, and where *threshing machines* are used, they are tied into sheaves if mown, but generally reaped with the sickle, in order in both cases to facilitate the process of threshing. When the grain becomes hard and the straw yellowish, they may be cut down. In general they should be cut before they are dead ripe, to prevent the shedding of the grain; and to make the

straw more valuable as fodder; oats are seldom damaged by rain after they are cut down, but high winds will cause the grain to shed, when opened out after they have been thoroughly wetted. The early kinds are more liable to these losses than the late ones, as the grain parts more easily from the straw. All kinds of grain are liable to shedding. The cutting of early oats quick, lessens, in some degree, the danger to which they are exposed by high winds, and it may also be lessened by making the sheaves small, for they are then sooner ready for the stack. At all times, however, more grain will be lost by shedding from the early oats than the later, because the grain of the later adheres more firmly to the straw. In harvesting oats in wet seasons the practice of *gating* the sheaves is generally adopted.

It appears from Mr. Young's *Tour through the Southern Counties*, that the quantity of oats sown, varies from five bushels two pecks, to two bushels and a half, and that the produce of the several quantities sown is as follows:—

	Q.	B.	P.
From 5 bushels and upwards	4	6	0
4 bushels	4	2	2
4 to 5 bushels	3	6	0
3 bushels and a half	2	2	0
2 bushels and a half	2	0	0

Mr. Young says, that he shall not venture to decide the most beneficial quantities of seed to be sown, but that he thinks we may fairly venture to reject the undistinguishing recommendations which have been given by several authors, in favour of using very small quantities of seed. Two bushels, and even one, have been named as seed enough for an acre, but this table proves the direct contrary. Four bushels are the most common quantity; if these gentlemen's opinions were founded on various practice, those farmers who use more than that would reap much less crops than their neighbours, instead of which they reap much greater. It is well known, indeed, that very small quantities of seed should be sown on land excessively rich.

A gentleman farmer may make his field as rich as a garden, and then find that one or two bushels of oats are sufficient to be sown on an acre; but he is not therefore to condemn his neighbours who sow more; the quantity of

seed should be proportioned to the poverty of the ground, for in rich lands corn tillers so much as apparently to cover the field, but in poor land it does not tiller at all, consequently the grains should be so much the nearer.

Mr. Young, in his *Northern Tour*, gives the different quantities of seed sown, with their respective average produce, as follows:—

	Q. R. P.
From 7 bushels sown, average produce	6 0 3
6 bushels	6 0 1
5 bushels	4 4 2
4 bushels and a half	4 5 1
4 bushels	4 0 0
3 bushels	4 0 1

Here he remarks, that although some circumstances remain doubtful from the above scale, yet the superiority of six or seven bushels is so great, that there is abundant reason to think that other quantities are not equal to these in advantage; and that the modern ideas of sowing small quantities of seed, are not universally to be adopted. He recommends that experiments should be tried on all sorts of soils, and in every situation, on small pieces of land, to decide this important point. Though Mr. Young is decidedly of opinion, that the quantity of seed should be proportioned to the poverty of the ground, yet there are not wanting others who say, that poor soils ought not to be loaded with too much seed, and that six or seven bushels an acre would utterly destroy cold clay lands. On a rich soil, oats, if sown thin, are very apt to run to straw; and one capital advantage is certainly gained by sowing thick, which is, that the weeds are thereby effectually smothered.

ON BUCK-WHEAT.

POLYGONUM (from *πολυς*, many, and *γυνε*, knee, many joints.

Class 8, 3. Octandria Trigynia. Nat. Ord. *Polygonæ*.

The characters are—*Calyx none; corollas five-parted, like a calyx; seed one, angular, covered; stamens and styles uncertain in number.*

POLYGONUM FAGOPYRUM (buck-wheat or beech-wheat). *Leaves cordate, sagittate; stem unarmed; angles of seed unequal.*—It is considered a native of Asia and not of Europe, though some-

times found in a seemingly wild state. It will not, however, bear the frosts of our springs or the severity of winter. In China and other countries of the East, it is cultivated as a bread corn. As an agricultural plant, it is valuable, as standing only a short time on the ground, but it produces little straw for manure. The flour is used in cookery and bread-making in various parts of Europe, for cakes and crumpets in England, and as rice or gruel in Germany and Poland.

In the culture of buck-wheat different methods may be adopted for the preparation of the soil. If it is intended for seed, it may be sown in May, but if to be ploughed in, June will be early enough. Any soil will do for it, but to produce a good crop, it will require to be sown on a rich soil. It may be also sown with grass seeds. *The season of sowing* ought not to be earlier than the last week in April or first of May, for fear of frost. *Broad-casting* is the proper mode of sowing, and a bushel of seed is required for an acre. It should be harrowed in, and as the growth advances, the large weeds must be pulled up and the crop guarded from the depredations of birds. *The manner of harvesting buck-wheat* is by mowing it the same as barley, and it must lie several days for the stalks to wither before it is housed. Being liable to heat, it is better to put it in small stacks of five or six loads each, than in a barn. It is in no danger of the seeds falling, nor does it suffer much by wet. *The produce of this grain* upon an average is from three to four quarters per acre. It ripens very irregularly, some plants being in flower, whilst in others the seed is perfect, and on this account it is not so productive by a great deal as it would be if all the plants ripened together. *The use of the grain of buck-wheat* in this country is almost entirely for feeding poultry, pigeons, and swine; but it is sometimes given to horses, and it is more economical for horse-corn than oats, and when mixed with bran is excellent feed. Four bushels of buck-wheat meal will be sufficient to fatten a large hog in three weeks, if he is afterwards fed with three bushels of pease broken in a mill. *Bees* extract honey from the flowers of this plant, as they contain much honey, and are of long duration.

OF PEASE.

PISUM (from the Celtic *pis*, a pea).

Class 17, 4. *Diadelphia Decandria*.
Nat. Ord. *Leguminosæ*.

PISUM ARVENSE (field pea). *Petioles four-leaved: stipules crenate; peduncles one-flowered*.—Like most domestic plants of great antiquity, its native country is unknown, though it is commonly referred to the south of Europe. This species is by some considered as a mere variety, not further removed from the *frame pea* than is the *blue Prussian* or the *crown pea*. A dry soil and season is essential for a good crop, unless the plants can be supported by sticks like the garden kinds.

The pea may be grown upon almost any sort of soil; it will, however, succeed best if the soil be dry, light, and perfectly clean. Pease may be sown after wheat, barley, oats, or other kind of grain; likewise after clover, saint-foin, &c., &c. On old ley grounds, when newly broken up, they will often produce a beneficial crop. There are two varieties adapted to field culture, the early and the late; of the former are the early Charlton, the golden hotspur, and the common white; of the latter, all those of the gray kind, as the Marlborough gray, the horn gray, and the maple gray, &c; the first of these sorts is generally considered the best for field husbandry. In sowing pease, regard must be had to the purpose for which the crop is intended. When they are intended for podding, and to be sent green to market, as is commonly the case near large towns, where they can be readily disposed of, they should be planted in succession at the distance of ten days or a fortnight, from about the middle of January, to the latter end of March; the first crop upon the lands most dry and mellow, and then proceeding to such as are more moist and heavy. By this mode of culture, regular supplies will be provided for the market. The white early sorts must be used for seed; and for general crops they may be sown as early in March as the soil can be properly prepared. For these crops the gray sorts are commonly used. If sown as late as April, the white kind should be preferred, as they grow faster; and in pea-crops, early produce is a matter of importance.

The quantity of seed to an acre must

vary according to circumstances. If the seed be sown in autumn, on rich ground, with an intention of pulling the pods green, three bushels and a half or four bushels to an acre should be allowed. The pease in these cases should be planted in rows, at the distance of about three feet from each other. This is commonly the practice in the vicinity of Dartford, in Kent, where the green-pea system of husbandry is carried on extensively and profitably to the farmer. For general sowings, when the land is properly cultivated, from three to three bushels and a half is the common allowance; the earlier sowings requiring more seed.

Many farmers sow the seed broadcast, but the drill system is preferable, it being more regular, saving considerably in the proportion of seed, and admitting of cleansing the ground with more ease and advantage. In this latter method, two bushels or two bushels and a half of seed will be a sufficient allowance.

The proper distance for drilling pease is about twelve or sixteen inches for hand-hoeing; but where the horse-hoe is to be employed, two or three feet must be allowed, and the depth for depositing the seed must be two or three inches. The use of the hoe in clearing the space between the rows, and in earthing up the young plants, is of essential advantage in promoting their growth and protecting them from the injuries of the season.

When pease are planted by hand, on a turf once ploughed, it is called dibbling. A man walking backwards, that he may not tread on the holes, strikes a dibber that makes two holes, sometimes three on a nine-inch furrow, and is followed by boys, who drop a pea in every hole. They are covered by a bush harrow; and the pease come up about four inches every way, and being so close, neither want nor admit of hoeing. Seven pecks, or two bushels of seed sow an acre. Pease when nearly ripe, are apt to be devoured by rooks, pigeons, &c. They should therefore be well watched. They are generally cut with a tool called a pease-make, which is half an old scythe, fixed in a handle, with which they are rolled, as they are cut into small bundles called wads, in other places wisps. These should be small to dry well, and should lie out

some days to wither. *In some counties* they are reaped with a hook, and sometimes mown, but that is an injudicious practice.

Of all crops this is the most uncertain, and it is rarely considerable; two quarters and an half an acre, are about the average produce; now and then four, four and a half, and five quarters, are gained, but probably not once in ten years. *When intended for seed,* there should be as many rows left ungathered, as may be thought necessary to furnish a sufficient quantity; and when the pease are in flower, they should be carefully looked over, to draw out all the plants which are not of the right sort; for there will always be some roguish plants, as the farmers term them, which if left, will cause the others to degenerate. The rest must remain until their pods are changed brown, and begin to split. The plants should then be pulled up and stacked till winter, or else threshed out as soon as they are dry, and put up in sacks. They should not remain too long abroad after they are ripe, for that will rot them; and heat, after rain, will cause the pods to burst, and eject the seeds. *The principal use of pease* is to fatten hogs; no other grain agrees better with those animals, especially when they are harvested dry, and ground into meal.

Bread, made of this meal, was formerly much in use in some parts of Scotland. The *straw*, if well harvested, is a very considerable object for fodder; it is little inferior to ordinary hay, and all sorts of cattle thrive well on it; but it is apt to gripe some horses, if given too soon. It should not be used before January; and, when it is found to gripe the animal, a few turnips, cabbages, carrots, or potatoes, will correct that tendency.

Farmers are induced to cultivate pease in the vicinity of large towns; because there is a great demand for them, they sell for ready money; the land rendered fit for the growth of turnips, and the stem of the plants when properly secured yield a large supply of fodder; and this is indeed the most profitable method of cultivating pease.

ON BEANS.

VICIA (From *guig*, Celtic; whence *Bison*, Greek, *vicca*, Latin, *vesce*, French, *vetch*, English, &c.)

Class 17, 4. Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Style bearded beneath the stigma.*

VICIA FABA (garden-bean). *Pods subsessile, subternate, torulose; leaflets ovate, entire; petioles not cirrhou; stipule, sagittate, toothed at base.*

β VICIA EQUINA (*field or horse-bean*). Different kinds of beans are cultivated with equal success in different districts according to the intentions of the farmers, and the nature of the soils in which they are grown. *The field or horse-bean*, however, appears to be the common parent of all the other varieties. It is generally cultivated on strong lands, as its stems grow high and effectually cover the surface. There are two or three varieties of the *field-bean*, which differ in size and colour; but the *Turk-bean* is that which is now in the greatest esteem, it does not grow so high as the rest, is a more plentiful bearer, and succeeds better on light land than the *common horse-bean*. The *tick-bean* is lower in stature and is also very productive. In Kent, the *large ticks* are preferred, but, in Essex, the *small ticks* are in high estimation; the lands being strong they yield good crops, and in the markets produce the best price. In Kent, some of the garden kinds are now introduced into field husbandry. The *Magazan* and *Mumford*, the *long pod*, and the *Windsor*, are the sorts chiefly cultivated. These, however, unless they are within reach of the London market to be sold in the pods green, answer no good purpose. February is the proper month for sowing them, if the weather permit, although they may be sown until the latter end of March, if the state of the weather prevents their being sown earlier. In general, however, it is better to sow them immediately after Candlemas. A dry summer is often fatal to the crop. In purchasing beans for seed, such as are *hard* and *bright*, and *not shrivelled*, in their appearance, should be chosen.

Beans were formerly sown broad-cast, but of late years the system of dibbling has been adopted, and it is now a common practice to have them planted by hand; men, women, and children, being employed for that purpose. In some districts they are sown with a drill-machine; and at such distances in the

rows as to leave sufficient space both for hand and horse-hoeing. Both these methods are superior to broad-casting, as the ground can be better cleaned, the crop will be more abundant, and the quality of the grain superior.

The preparation for the crop on moist land should be as follows:—Lay on the manure early in autumn, and immediately plough the land into ridges of two feet six inches wide, and let it remain in this state until the season for planting, when the seed may be dibbled in, one row of beans into the middle of each ridge, at the distance of about three inches from bean to bean. Let them be covered immediately, either by children with a garden rake or hoe, or if the surface of the ground be dry and crumbly, a horse with a bush-harrow should be used. The crop will completely cover the ground, if the land was properly manured, as they will branch out sideways three or four stems from each root. *It is necessary to plant them early*, that the roots may get sufficient hold of the land, and that the stems may afford sufficient shade before the hot weather set in: it will also be some security against an insect called *the black dolphin*, which is the greatest enemy the bean is exposed to. *The soil suitable for beans* is one that cannot be well worked without damage in the winter and spring; and it should, therefore, be manured and ploughed into ridges in the autumn.

Broad cast sowing, is that mode of cultivation by which the seed is committed to the soil by the hand of man, without the aid of machinery. This is an operation so perfectly understood by farmers in general, that it needs no further explanation. It is generally believed that broad casting requires more seed, that much seed is wasted by this method, and that the crops are more irregular and less productive. It is, therefore, not so much practised as formerly upon dry soils, where machinery can be used or planting by the hand performed: but it is well adapted for strong, adhesive clayey soils, where machinery will not work, nor the surface of the soil bear much treading after the seed is committed to the ground.

The drill is an engine that plants the beans in rows; it makes the channels, sows the seeds in them, and covers

them with earth when sown, and all this is accomplished with expedition. Where the drill is used the weeds are more easily destroyed, and less seed is required to be sown. Great care is, however, necessary in the proper management of the machine. *The quantity of seed* to an acre must be greater in Scotland than in England. In the former country four bushels will be requisite, but in the latter, from two to two and a half will be sufficient.

The after culture of the bean crop is, first by harrowing a little before the young plants reach the surface. *When some progress has been made in their growth*, it will be necessary, if the weeds are numerous, to employ first, the horse-hoe and then the hand-hoe; and if, after these operations, any weeds are left, pull them up by the hand.

Beans should be quite ripe before they are cut down; in wet seasons they ripen badly. In some counties they are mowed, and in others reaped, and made into shocks. In both cases, as much straw as possible should be obtained on account of its value. *Beans are stacked* either round or oblong. *The produce of beans* is usually from twenty-five to thirty bushels per acre. *Beans are generally used* as food for horses and for feeding hogs. *The flour of beans* is more nutritive than that of oats; it is also more productive, as it is said to yield fourteen pounds more in a bushel than oats. *The diseases of beans are the rust, mildew, and black fly*. This fly attacks the tops of the stems, and is very prolific. Some persons cut off the tops of the plants, but it is difficult either to prevent or cure this disease, and beans planted in gardens as well as in the fields are equally exposed to it.

PLANTS CULTIVATED FOR ROOTS.—ON THE POTATO.

Of the roots which are used to afford subsistence to man, the *potato* has hitherto been the principal. Its taste resembles, more nearly than any other root, the taste of bread. From no other crop is so much food derived as from this valuable esculent: an acre of potatoes producing sufficient to feed double the number of people that can be fed from an acre of wheat. Potatoes are also a nourishing and healthy food, relished almost by every palate.

SOLANUM. (By some ingenious com-

mentators the word has been derived from *solari*, to comfort. The derivation may be possible, but the application is not evident).

Class 5, 1. Pentandria Monogynia. Nat. Ord. *Solanæ*.

The characters are—*Calyx persistent; corolla rotate or campanulate, five-lobed, plaited; anthers in some degree united, opening by a double pore at the end; berry two-celled, many seeded.*

SOLANUM TUBEROSUM (potato). *Root tuberous; stem herbaceous; segments of leaves unequal, the alternate ones minute; pedicles stalked.*—This root, which at the present moment forms such an important and indispensable article in the diet of the poor, which is cultivated in such immense quantities to meet the incessant demands of every market, was, about two centuries ago, only retained as a curiosity in some botanic gardens.

Gerarde, in his *Herbal*, published in 1597, gives a figure of the potato, under the name of *potato* of Virginia, whence, he says, he received the roots; and this appellation it appears to have retained, in order to distinguish it from the *battatas* or *sweet potato* (*convolvulus battatas*) till the year 1640, if not longer. "The *sweet potato*," Sir Joseph Banks observes, "used in England as a delicacy long before the introduction of our potatoes, was imported in considerable quantities from Spain and the Canaries, and was supposed to possess the power of restoring decayed vigour. The kissing-comfits of Falstaff, and other confections of similar imaginary qualities, with which our ancestors were duped, were originally made of these and *eringo* roots." Gerarde and Parkinson mention them as delicacies for the confectioner, and not as common food. Even so late as Bradley's time, they are spoken of as inferior to *skirrets* and *radishes*. Although the fact be certain, that this root came to us from Virginia, it by no means follows that it is indigenous of that country; on the contrary, it is more than probable that it was first found by the Spaniards, in Peru, of which country it is known to be a native.

Don Jose Pavon, the celebrated author of the *Flora Peruviana*, who resided many years in South America, in a communication to A. B. Lambert, Esq., dated Madrid, September 23rd,

1817, says "The *Solanum tuberosum* grows wild in the environs of Lima, in Peru, and fourteen leagues from Lima on the coast: and I myself have found it wild in the kingdom of Chili. The Indians cultivate it in great abundance, and call it *papas*. The roots, although very small, grow remarkably luxuriant, and the stems, produced by them, covered a space full four yards in circumference. The stems and leaves were rougher and more rigid than the cultivated *potato*, and the flowers somewhat smaller. The leaves at first were equally pinnate, but, as the plant advanced in flower, they lost this character, and became unequally pinnate as in the cultivated *potato*." Mr. Lambert states, that the *wild potato* is evidently susceptible of great improvement, for, having obtained from the *Horticultural Society* some cuttings of the plants brought home by Mr. Caldeclugh, the tubers increased in size, and improved in quality.

The potato is thus ascertained to be a native of South America. It was brought to England by the Colonists sent out by that enterprising voyager, Sir Walter Raleigh, in 1586; and first planted by Sir Walter, on his estate of Youghall, near Cork; and "cherished and cultivated for food in that country," before it was known in England. It is related of Sir Walter Raleigh's gardener, that having raised a crop of potatoes, he brought to his master the apples or fruit, asking him with emphasis "if that was the fine fruit he anticipated?" Sir Walter having examined them, affected to be dissatisfied, and ordered him to root out the weed. The gardener did as he was desired, and found a bushel of potatoes.

It is not a little remarkable, that neither in Italy, Spain, Portugal, nor even in France, has it ever been generally cultivated or highly esteemed. In Italy, the prejudice against it was so great, that not half a century since, when a ship load was sent to Naples, to relieve the wretched inhabitants from a famine, it is said that they chose to perish rather than feed upon them; and although they have since grown wiser, especially in the northern parts of that country, still the *potato* is not in general use, and a strong prejudice yet exists against them, even in Spain and Portugal.

This valuable root is now extensively cultivated in England, but its utility does not appear to have been much known before the middle of the eighteenth century. *Potatoes*, as an article of human food, are next to wheat, of the greatest importance in the estimation of the political economist. They may be advantageously used in the manufacture of bread, especially when the flour is made from damaged wheat that has grown or sprouted in the shock. They may also be mixed with flour and used in puddings, and will make excellent starch.

The *yam* or *Surinam potato* was formerly considered of importance to the farmer, but as it cannot be used as human food, it is not recommended for extensive cultivation. The value of *potatoes* as a fallow crop, compared with turnips and cabbages, may be thus considered. *Potatoes* are more nutritious, and fatten cattle much quicker than either turnips or cabbages, both of which are liable to perish by frost and thaw. If turnips and cabbages survive the winter, they encumber the soil in spring, when it should be prepared for a crop of grain; but *potatoes* being properly laid up in autumn, will serve as food for cattle until the grass is sufficiently grown in the spring to be ready for pasturage. The varieties of the *potato* are innumerable; they differ in being farinaceous, glutinous, or watery; in tasting agreeably or otherwise, and in cooking readily or tediously. They also differ in earliness, lateness, form, size, and colour; the earliest varieties of the *potato* are chiefly cultivated in gardens; we give here the field varieties. The early kinds are, the *early kidney*, the *nonsuch*, the *early shaw*, and the *early champion*. The late field varieties in most repute, are the *red-nosed kidney*, and *large kidney*. *Bread-fruit*, raised in 1810, from seed, and esteemed one of the best field *potatoes*, being white, mealy, well-tasted, and prolific. *Lancashire pink-eye*, good. *Black-skin*, white interior, and good. *Purple*, very mealy, productive and keeps well. *Red apple*, mealy, and keeps the longest of any. *Tartan* or *purple* and *white skinned*, an esteemed Scotch *potato*, prolific, mealy, exceedingly well-tasted, and keeps well.

The varieties grown exclusively as food for live stock, are the *yam* or *Surinam potato*, large, red and white

skinned, and the interior veined with red; flavour disagreeable and unfit for human food. The *ox noble*, large, yellow without and within, very prolific, unsuitable for the table. The *late champion*, large and prolific.

New varieties of *potatoes* are easily procured from the seed. When the stalk has ceased to vegetate and is drying up, pluck off the apples, the seed being then fully ripe. Sow the seeds in beds in March, and take up the *potatoes* in October. Select the fairest and best; secure them from frost, by thoroughly drying, and covering them with dust of sifted rotten wood or coal ashes. Plant them in April following, at the distance of fifteen inches asunder, and when the plant is two inches high, mould them up with fresh earth; keep them clean from weeds, and the produce of each *potato* separate until the next year. In general the produce of the seed will resemble the parent stock: but red varieties will give both white and red offspring, and amongst the offspring of kidneys will be found round-shaped tubers. Some of the earliest sorts of *potatoes* do not blossom, and consequently do not under ordinary management produce seeds. In order to effect this, in the early part of the summer remove the earth from the roots of the plants, and pick off the *potatoes* as they begin to form. Thus the strength of the plant will flow into the leaves and herbage, and produce blossoms and apples.

In choosing one or more sorts, procure samples, taste them, and choose the best. The *Lancashire pink*, cultivated round Prescott, near Liverpool, seems to be the most excellent both for mealiness and flavour. The soil in which the *potato* thrives best, is a light loam, neither too dry nor too moist, but the richer the better. The best flavoured table *potatoes* are generally produced from a newly broken up pasture ground not manured. In preparing the soil for *potatoes*, free it as completely as possible from root weeds. Unless in the immediate vicinity of large towns, or in very populous manufacturing counties, *potatoes* do not constitute a regular rotation crop, though they are raised almost every where, to the extent required for the consumption of the farmer and his servants. The season for planting *potatoes* in the fields, will depend much

on the soil and climate. These should be both dry for an early crop. In Ireland, Lancashire, and Scotland the best potatoes are grown. March and April are the best months for planting. *In preparing the sets of potatoes*, opinions vary. Some cultivators plant the *potatoes* whole; others say that large sets are better. Fair sized cuttings of large *potatoes*, with two or three good *eyes* or *buds* have produced excellent crops. *The set* ought to be large, about one-fourth part of the *potato*, or if the *potato* be small one-half of it should be used for a *set*. From eight to ten hundred weight of *sets* will be required for an acre.

The modes of planting the potato are various. *Where spade culture is employed*, they are very frequently planted on beds of four or six feet wide, with a trench or gutter of a foot or eighteen inches wide, which supplies soil for earthing up the *potatoes*. *In planting the potato upon sward land*, the turf should be turned down, and the *sets* put in with a dibble.

A mode of planting potatoes, and at the same time trenching the land, is adopted in Lancashire and in some parts of Scotland. The farmer carries the dung and lays it on the field in heaps, at proper distances; the manufacturers and people who rent the field, form a trench across the end of the ridge three feet wide, and from ten to fourteen inches deep; a second trench is then marked off, and the top soil thrown into the bottom of the former trench, upon which dung is laid, and the *potatoes* planted at the distance of eight or ten inches from each other, and the first trench is then filled up and made level from the earth taken from the bottom of the second trench. The field is thus trenched, manured, cleaned, and made fit for the reception of any kind of grain.

The farmers in the northern districts, when they *plant potatoes*, drill the land in the same manner as when it is prepared for turnips. Ridgelets from twenty-seven to thirty inches broad are formed, the manure is placed between them, and on this manure the *sets* are placed from four to eight inches asunder, and then covered with earth which is turned back upon them. *When sets are cut for planting* they should be left to dry for a few days before they are

planted. *The after culture of potatoes* consists in harrowing, hoeing, weeding, and earthing up. *The taking up of the crop of potatoes* on a small scale, is generally performed with the spade or three-pronged fork; but in the row-culture by the common plough. *Potatoes are stored and preserved* in houses, cellars, pits, pies, and camps. Whatever mode is adopted, it is essential that the tubers be perfectly dry, otherwise they are sure to rot, and a few rotten *potatoes* will contaminate a whole mass.

The produce of the potato varies from five to eight, and sometimes ten tons. The *yam* is the most prolific, and has produced twelve tons or four hundred and eighty bushels per acre. *The most important application of the potato crop* is for the purpose of human food. It is said that *forty thousand tons of potatoes are annually manufactured into flour* within a circle of eight leagues around the City of Paris, for the use of confectioners and bakers, and that the price is considerably higher than that of wheaten flour.

The quantity of farina which potatoes produce, varies according to the species, and also to the period when it is extracted. Two hundred and forty pounds of potatoes, produce of farina or *potato-flour* in

August from	23	to	25 pounds
September .	32	to	38
October . .	32	to	40
November .	38	to	45
March . . .	45	to	38
April	38	to	28
May	28	to	20

In Russia, sugar and a sort of treacle are manufactured from the *potato*.

Amongst extraordinary applications of the potato may be mentioned cleaning woollens, and making wine and ardent spirits. *In the use of potatoes as food for live stock*, hay, straw, chaff, and other similar things have been advantageously mixed with them, especially in the later winter months for horses, cows, &c. With barley-meal and pollard they will fatten neat cattle and hogs.

Frosted potatoes should be thawed in cold water, or pared, then thawed and boiled with a little salt. Salt or salt-petre, chaff, or bruised oats, boiled with them will make them fit for cattle, swine, poultry, &c. Starch and paste

for weavers, bookbinders, and shoemakers, may be made from them when too sweet to be eaten, and also an ardent spirit from hydrometer proof to ten per cent. over proof.

ON THE TURNIP.

BRASSICA (from the Celtic *bresic*, which signifies a cabbage).

Class 15. Tetradynamia. Nat. Ord. *Cruciferae*.

The characters are—*Silique roundish; style small, short, obtuse; seeds in one row; calyx spreading.*

BRASSICA RAPA (the turnip). *Radical leaves lyrate, without glaucous bloom, rough; cauline cut; upper entire.*—It is not exactly known which is the native country of this most useful root. It belongs to a natural family of plants, called *Brassica*, including the different varieties of *kale* or *colewort*, *cabbages*, *cauliflowers*, &c. In its wild state it is not to be recognised by ordinary observers, from wild mustard. The *turnip* was extensively cultivated by the Romans in their fields, and used as food for their cattle; by them it was probably introduced into Britain, and raised in gardens. But what is very singular, it is only of a very late date since it has been extensively cultivated in our fields, or made an article of regular husbandry, and has occasioned one of those revolutions in rural art which are constantly occurring among husbandmen; and though the revolution came on with slow and gradual steps, yet it may now be viewed as completely and thoroughly established.

Before the introduction of this root it was impossible to cultivate light soils successfully, or to devise suitable rotations for cropping them with advantage. It was likewise a difficult task to support live-stock through the winter and spring months; and, as for feeding and preparing cattle and sheep for market during these inclement seasons, the practice was hardly thought of, and still more rarely attempted, unless where a full stock of hay was provided, which only happened in very few instances. The benefits derived from turnip husbandry are, therefore, of great magnitude. Light soils are now cultivated with profit and facility; abundance of food is provided for man and beast; the earth is turned to the uses for which it is physically calculated;

and, by being suitably cleaned with this preparatory crop, a bed is provided for seeds, wherein they flourish and prosper with greater vigour than after any other preparation.

Turnips and clover are the main pillars of the best courses of British husbandry; they have contributed more to preserve and augment the fertility of the soil for producing grain—to enlarge and improve our breed of cattle and sheep—and to afford a regular supply of butcher's meat all the year, than any other crops; and they will probably be long found vastly superior, for extensive cultivation, to any of the rivals which have often been opposed to them in particular situations.

The turnip is now universally raised throughout Europe, and even in the northern parts of Russia and Lapland. It is *biennial*, or lasts for two years. In the second season after it is sown, it shoots out a long stem bearing the seeds of the plant, contained in long pods. There are several varieties of this useful root, some of an earlier, some of a later growth, suited to the various seasons; it seems to thrive best in a somewhat light soil, as in a strong soil the roots grow rank, and are sticky; turnips sometimes grow to an enormous bulk; specimens are mentioned measuring a yard round, and weighing twenty-one pounds, twenty-nine pounds, and even thirty-six pounds.

Pliny, among the ancients, and Tragus, among the moderns, speak of turnip roots as weighing each forty pounds; Amatus, of some amounting to fifty or sixty; and Matthiolus, of many approaching to one hundred. Yet we are told that four pounds is now reckoned an extraordinary weight for a turnip root in Italy. Whether the old accounts be exaggerated, or the modern produce misrepresented, we cannot ascertain. The greatest weight mentioned in England is thirty-six pounds. At Stow, in Gloucestershire, a farmer produced four turnips, weighing one hundred weight, and offered to produce from a small given space, eighty turnips, which should weigh a *ton*.

The tender tops boiled are frequently eaten in the spring as greens with meat.

All the different sorts of this excellent plant, are for the most part distinguished by the *form* or shape of the

bulb or root, which appears in some measure to depend upon the diversity of soil, and the nature of the culture of the plant. *But the varieties which have been used as field crops* with the greatest benefit and success in different parts of the country, are principally of these *two* kinds; those having a *round* or *flattish* formed root, that rests much on the surface of the land, and those in which the root is of the more *long tap-rooted* form, penetrating deeper into the mould with the lower part of the root, but standing higher above it with the upper portion of the bulb. In the first or *round flat-rooted* sort there is likewise much variety in the appearances of the tops as well as the roots, though the latter are mostly a little round and flattish. They are commonly distinguished in field-culture into the *red-round* or *purple-topped*, the *green-topped*, the *white-topped*, the *yellow-rooted*, the *black*, or *red-rooted*, the *hard* or *stone*, and the *Dutch* turnip. In the latter, or *long tap-rooted* sort, there is some degree of variety in their roots. They are usually known and discriminated by the farm-cultivator under the titles of the *tankard*, the *tap-rooted*, the *pudding*, the *oblong*, the *long round*, and the *hardy* or *Russian* turnip.

Skilful farmers prefer the *large green-topped* turnip, because the roots grow to a large size, and continue good much longer; it also grows above ground more than any of the others, which renders it preferable for feeding cattle, and being the softest and sweetest, even when very large, it is most esteemed for the kitchen. In very severe winters, however, this is in greater danger of suffering by frost, than those whose roots lie deeper, especially if the ground be not covered with snow; for when the roots are alternately frozen and thawed, they rot sooner than those which are more covered and less tender. Roots of this sort have been boiled when more than a foot in diameter, and ate as sweet and tender as any of the smallest that could be found. The next in goodness to the green-topped is the *red* or *purple-topped* turnip, which will also grow large and be extremely good for some time, but the roots will become stringy much sooner than the other. *The long-rooted, the yellow, and the black-rooted* turnips, are now rarely cultivated, but for the sake of variety, none

of them being so good for table or feed as the red and green-topped sorts. The *French* turnip is not much cultivated in England, but in France and Holland it is in great esteem, especially for soups, in which, being small, the roots are boiled whole: they must be used whilst they are young, otherwise they are rank and stringy. *The early Dutch* turnip is chiefly sown in the spring to supply the table before the others can be procured; and when drawn off young it is tolerably good. *The ruta бага*, or *Swedish* turnip may be preserved for consumption until June.

The Siberian or *Russian* turnip is of inferior quality. In different districts where this root is largely cultivated, different sorts of this plant are employed, and it is not improbable that some sorts may be more proper for some qualities of land than others, though little has yet been done in the view of deciding this point. Nor is it unreasonable to suppose, that among the many varieties of this highly valued plant, there may not be some which, in addition to their superior hardness, possess a greater proportion of the nutritious principle than others.

Much might probably be done in getting good sorts, by collecting seed from such as are the most hardy, and which grow to a large size, and sowing it in continuance. *The choice* of sorts may be considered as including the white globe, yellow, and Swedish, according as early, middling or late, supplies are required. *The best climate* for turnips is that which is cool and temperate. The turnips grown in the southern counties of England are not equal in size to those grown in Northumberland, or even further north, or in Ireland, where the climate is much more humid than it is in England.

Admirably as the turnip is calculated for cleaning land, and feeding cattle and sheep, it is to be lamented that it is so liable to accidents and failures as not to be absolutely depended upon for these purposes. It has the fly and many other enemies of the insect tribe to contend with in the early stages of its growth. The turnip crop is precarious, principally because the farmer is obliged to depart from the common course of nature in accomodating it to his wants. Instead of putting the seed into the ground in the spring months,

when there would be as great a certainty of a crop as of any other vegetable, he is obliged to defer sowing till the hottest season of the year comes on, when, unless he is so fortunate as to have a few rainy days, or cloudy weather, with frequent showers, he can have little hope of success.

The turnip is a sort of crop which is grown after many other different kinds, as those of a wheat stubble, a pease ley, tare, potato, or any other similar kind of crop as well as after the process of paring and burning the layers of old grass lands. It is a practice, too, in some districts to have two turnip crops in succession, as the means of cleaning the land more effectually, which has been found to answer greatly in the barley or other crops that may be grown after them.

The soils which are the most proper for the growth of this sort of crop, are all those of the more light, friable, loamy, medium sandy, and other kinds, which have a sufficient depth; but it may often be raised with success and advantage on many other sorts, which have the surface mouldy parts sufficiently fine, without there being too much moisture below; as those of the thin, gravelly, loose, chalky, and many other sorts and qualities; even on the loamy clays, in some cases, when properly managed in their tillage preparations, and other ways.

A late eminent practical writer has well remarked that from the success of the culture of this useful crop on lands that greatly differ in their nature and qualities, it is plain that the plant admits of more latitude in respect to soil than many other sorts, although cultivators of it have generally thought that light mellow soils were the only kind suitable to its cultivation, and this opinion may probably have prevented the culture of it so extensively as it would otherwise have been. Upon whatever soil turnips are planted, the ground should be finely pulverized, as the crop appears to depend more upon this circumstance than upon the quality of the ground itself. For, although the soil suitable for turnips should always be of a light description, when the seasons are favourable, plentiful crops may be raised on almost any soil; but, where the soil is wet, they cannot be easily removed or eaten

off by sheep. It would, consequently, be disadvantageous to the farmer to sow turnips upon such soils; but wherever sheep can be congregated for the purpose of feeding, the soil is sure to be enriched by their dung.

In the choice of seed the farmer must rely on the integrity of the seed-dealer, as it is impossible to discover from the grains whether they will turn out true to their kinds, but we should, however, recommend his growing his own that he may have it pure and uncontaminated.

Turnip-seed requires to be frequently changed, and the best is generally procured from Norfolk and Northumberland; these being the best counties for the growth of turnips. *It is proper to mix old and new seed together*, as the new will first vegetate and produce stronger plants which are more secure from the attacks of the fly. It was very difficult a few years since to procure from any seedsman a single pound of pure Rutabaga or Swedish turnip-seed. This occasioned heavy losses to many farmers and compelled them carefully to raise seed for their own supply, which in most cases is by far the best practice.

The usual mode of raising seed is to select the best specimens of the kind intended to be procured when they are full grown. In the flowering seasons the seeds of other plants of the Brassica tribe frequently mix with those of the turnip, by which means the progeny becomes hebridized: to avoid this it is better either to remove all other plants from the field before the turnips are in bloom, or transplant them to some other soil, at least two feet asunder each way, observing to keep the ground clear from weeds, until the turnips have spread so as to cover the ground, when they will prevent the weeds from growing; and when the seed-pods are formed, they should be carefully guarded against birds, who would otherwise devour them, especially when they are nearly ripe. *When the seed is ripe*, it should be cut up, and spread to dry in the sun, after which it may be threshed out and preserved for use. It is generally understood that no turnip-seed is fit to be sown that has not been raised from transplanted roots. In Norfolk, it is thought that if turnips be gathered from untransplanted roots, the turnips will become coarse-necked

and foul-rooted, and the flesh of the root rigid and unpalatable, and that if they be gathered year after year from transplanted roots the necks will become too fine and the fibres too few, the plants acquiring a weak delicate habit, and the produce, though sweet, being small: sweetness therefore, and not size, being the quality requisite for the table: it is a good rule for the *gardener* to raise his seed generally from transplanted roots, but it is the *farmer's* interest to avoid the two extremes of coarseness and delicacy. This he can accomplish by sometimes transplanting his seed plants and sometimes letting them run up in the seed bed. It is found by experience that transplanting two, three, or four years, and letting the plants run up in the third, fourth, or fifth, will keep the stock in the desired state. The time of transplanting is from Old Christmas to Old Candlemas. The cleanest plants are the best, without much respect to size; a piece of good ground near an habitation is most proper for the purpose, because on such a spot the plants can be most easily defended from the birds.

To prepare turnip-seed for sowing, mix the seed half new and half old together; take half the quantity thus mixed and steep it in water three or four hours, then mix the steeped and unsteeped seed together and sow it immediately. This produces four *braids* or risings of the seed instead of one, and thus a better chance is offered of escaping the fly. The quantity of seed requisite is from two to two and a half pounds avoirdupoise per acre. Insects are so apt to destroy the turnip-seed that a sufficient quantity must be used. It should not, however, be sown too thick, because the plants, when very thick, will become interwoven together, and it will be difficult to thin them properly. The time of sowing, in the north of England and Scotland, is from the first to the end of June, but frequently continued until the middle of July. It is not advisable to sow later than this in the north, but it is often done in the English counties. When the sowing of the turnip is broad-cast, hand-hoeing is used, but, when it is done by machinery, the horse-hoe is employed.

When turnips are cultivated in the field, the seed is sown by the hand on a flat surface, or it may be sown on the

tops of small ridges. The latter mode is supposed to be the more advantageous, as then, by the process of hand-hoeing, during the growth of the plants, the lands may be cleaned better, easier, and more effectually. It is preferable, also, both on account of its expedition and economy. The manure will by this means be better covered, and being more efficiently applied to the roots of the plants, less of it will be requisite; the turnips will be kept dryer, and crops may by these means be raised on wet lands, which would otherwise be incapable of yielding a return of any value.

The land should be thus prepared for turnips. It must be ploughed in autumn, after the preceding crop of grain has been reaped. If the soil be not of a very dry quality, the land is formed into ridges of fifteen feet or more, and care is taken that no water shall stagnate on the ground. In this condition the land remains during the winter, and it is ploughed again in spring, as soon as the ground is sufficiently dry for the operation of the plough, and the farmer has time to attend to it. This second ploughing crossing the first, the land is then repeatedly grubbed and harrowed in various directions for the purpose of pulverizing it and of dragging to the surface, and disengaging all weeds and roots; the roller must frequently be employed to aid this process. All the weed-roots thus brought up are then carefully gathered into little heaps, and either burnt on the ground or carried off to form a compost usually with quicklime, &c. for the succeeding year. The land is then ploughed a third time, harrowed well, rolled, and the weed-roots picked out as before. If the land is in a good and clean state after turnips have been some time a rotation crop, no more ploughing will be required. It is next laid up in ridgelets, from twenty-seven to thirty inches wide, either with the common swing plough, or one with two mould-boards, which forms two sides of a ridgelet at once. Well-rotted dung, at the rate of twelve or fifteen tons per acre, is then carried to the field, and dropped from the cart in the middle one of three intervals, in such a quantity as may serve for that, and the interval on each side of it. The dung is then divided equally amongst the three, by a person who goes before the spreaders, one of

whom, for each interval, spreads it with a small three-pronged fork along the bottom. The plough immediately follows, and reversing the ridgelets, forms new ones over the dung; and the drill harrow, commonly one that sows two drills at once, drawn by one horse, deposits the seed as fast as the new drills are formed. This drill-machine is usually furnished with two small rollers, one that goes before the sowing apparatus, and levels the pointed tops of the ridgelets, and another that follows for the purpose of compressing the soil, and covering the seed. From the time the dung is carted to the ground, until the seed is deposited, the several operations should go on simultaneously; the dung being never allowed to lie uncovered to be dried by the sun and wind; and the new ridgelets are sown as soon as formed, that the seed may find moisture to accelerate its vegetation.

Manure may be considered as essential to turnips. Turnip-land cannot be made too rich, for, in fact, the weight of the crop depends in a great measure upon its condition in this respect. Manure is sometimes applied to the crop which immediately precedes the turnips; but, to answer well in this way, the land must be naturally of an excellent quality. In other cases, where the land is in good order, it is laid on the stubble previous to the first ploughing. But generally the dung is laid on immediately before the seed is sown; the ground is formed into drills or ridges, and the manure spread in the intervals between them; the drills are then split by the plough, the earth on each side covers the dung, forms a drill where the interval formerly was, and furnishes a bed for the seed. These operations are now so well understood, that it is unnecessary to describe them more particularly.

Lime, sea-weed, and ashes are sometimes applied to the turnip-crop, together with dung. This may be done by laying the lime upon the stubble after harvest, or better still, by spreading it upon the ground and harrowing it well immediately before the forming of the ridgelets for the reception of the dung. Putrescent manures, however, are considered superior to the calcareous for the production of this plant; and all the former kind may be used with effect. Street dung is an exceedingly

good manure, sea-weed will also be useful: this last, however, is not applied in the manner of the farm-yard dung, but is carried off as it is cast on shore, laid on the surface, and suffered to remain so till the land is ploughed. Ashes generally produce a good effect in causing the seeds to vegetate quickly, but the fertilizing powers of some of these do not appear to be of a permanent nature. Bruised bones and various other substances have been used with much benefit; but it is to be observed that putrescent manures form the main support of the turnip cultivator, and that the others are only to be regarded as subsidiary.

The first enemy of the turnip is the fly, as it is commonly called, or as others name it, the *flea*, or, as it is provincially termed, the *black dolphin*. It is, in fact, a small insect of the *coleopterous* or *beetle* tribe, and is named by naturalists *Chrysomelane morum*. In hot summers it abounds to an amazing degree, and may be heard in a field or garden among the leaves of turnips or any of the cabbage kind, making a pattering like rain from its continual skipping. This mischievous insect is not more than from one-tenth to one-twelfth of an inch in length; it attacks the plant as soon as it appears above ground, whilst it is in the seed-leaf, and as soon as the rough leaves are put out strong, the plant is supposed to be safe from this enemy, which is calculated to destroy an entire crop once in five or six years, besides the partial damage which it does in most years. It has, however, a rival companion in mischief, the *turnip bug*, which becomes a small fly, about one-twentieth of an inch long, and not larger than a grain of turnip-seed. It is the same as the *black-bug*, *collier*, or *negro*, with which beans are frequently infested, in some places provincially called *smother-fly*. The bugs, or fly in a larva state, frequently cover the under sides of the seed-leaves, and are of different colours, yellow, green, or black: when the seedling plants are infested with them, they make no progress, nor any visible effort to get into rough leaf: fifty of these vermin have been counted under one pair of seed-leaves, sucking the juices, through their long probosces. The smallest of the flies, or *aphides*, are of a cream-colour, the next green, the

next to these reddish-green, and the largest black.

The destruction, however, which is imputed to the fly, or to speak more properly, the turnip-beetle, sometimes seems to originate in the season. When the soil is fully and permanently moistened by a steeping rain, the seed will vegetate, the plants will push into rough leaf, and rise without a check, though the beetle and their other insect enemies be in full force; but if the turnips have only showers to depend on in hot dry weather, the seed will vegetate; but by the time the seed leaves are formed, the moisture is wholly drawn off, by the intervening days of draught, and the plants deprived of nourishment, pass away parched up as in an oven.

The injury done by the fly being confessedly great, many remedies have been proposed for it, although it is much to be feared that they are by no means effectual; but whatever will add vigour to the young plants, will prevent their being destroyed by the fly, for these never attack them till they are stunted in their growth. Good tillage, therefore, and having the land in heart, is of more consequence to prevent the ravages of the fly, than all the nostrums that have been published.

In dry seasons the ground should be well looked over, and when the young plants begin to be attacked by the fly, the land should be strewed all over with vegetable ashes, and the night following it should be rolled. If rain comes in a day or two after, the turnips will soon be out of danger, by washing the salts of the ashes to their roots: if not, in a week's time, a fresh dressing of ashes with rolling should be applied a second time. It is scarcely necessary to add, that the ashes should be kept in a dry place; where there is only a small quantity of ashes, the farmer may have recourse to a compost of these with soaper's ashes, coal ashes, quick-lime, and soot, mixed well by turning them two or three times and passing them through a sieve.

When large patches are irrecoverably gone, it is best to plough immediately, and sow again, harrowing in the seed. The early stone turnip is best for this purpose, from its coming to maturity sooner than the common sort, and may be sown twenty days after the first

sowing. The *bug-fly*, or *aphis*, is by no means so tremendous an enemy as the beetle; being extremely soft and tender, and therefore easily crushed: a light roller, especially if it were muffled in some soft elastic covering, so as to press in between the clods, might probably be effectual in destroying these insects, without injuring the plants. Another danger of the crops being destroyed, is from the *caterpillars*. These caterpillars are provincially called *black cankers*; their ravages are not so universal as the fly or turnip-beetle, but though partial, are in some seasons very great, especially near the sea-coast. Many remedies have been proposed against this destructive insect, but *ducks* have been found most successful in curing this evil. The ducks should be half or three quarters grown; old ones are lazy and will sooner eat the turnip-roots than run after the caterpillars. They should be regularly driven to water, and rested three or four times a day. After drinking, they disgorge the caterpillars in great abundance, and soon fall to again with fresh appetite. Four hundred ducks have most completely cured thirty-three acres in five days, but twenty or thirty may be employed on a small farm with great effect. When caterpillars grow scarce, the ducks will take to the turnip-tops, and do more harm than the few caterpillars which are left. It is then better to turn out the ducks and pick off the caterpillars by hand.

The slug and snail are injurious both to the seed in the ground, and to the plants, the roots and leaves being both endangered by them. This, however, is a trifling evil in comparison with the others. Mr. Loudon, in his *Encyclopædia of Gardening*, recommends as the most effectual mode of destroying them, immediately after the turnips are sown, is to strew the ground with cabbage-leaves, or leaves of any of the *Brassica* tribe. On these the slugs will pasture, especially if they be beginning to decay (which produces a sweetness), and may be gathered off by women and children every morning. By procuring as many cabbage-leaves or hands' full of decaying pea-haulm, or any similar vegetable, as will go over a ridge or two, say at the rate of a leaf to every square yard, a whole field may soon be

cleared by picking off the slugs, and removing the leaves once in twenty-four hours. This mode we have found most effectual in cleaning a whole field of slugs.

Mildew and blight attack the turnip in different stages of its growth, and always retard it.

The red or wire worms attack the roots, and cannot be guarded against. Turnips sometimes produce *forked excrescences* resembling toes. This disease admits of no cure. The following account of it is given by William Spence, President of the *Holderness Agricultural Society*, in 1811. "In some plants the bulb itself is split into several diverging lobes. More frequently the bulb is externally tolerably perfect, and the tap-root is the part principally diseased, being either wholly metamorphosed into a sort of mis-shapen secondary bulb, often larger than the real bulb, and closely attached to it, or having excrescences of various shapes, frequently not unlike human toes (whence the name of the disease) either springing immediately from its sides, or from the fibrous roots that issue from it. In this last case, each fibre often swells into several knobs, so as distantly to resemble the runners and accompanying tubers of a potato; and very often one turnip will exhibit a combination of all these different forms of the disease.

These distortions manifest themselves at a very early stage of the turnip's growth, and plants scarcely in the rough leaf, will exhibit excrescences, which differ in nothing else than size from those of the full-grown root. *The leaves discover no unusual appearance*, except that in hot weather they become flaccid and droop; from which symptom, the presence of the disease may be surmised without examining the roots. These continue to grow for some months, but without attaining any considerable size, the excrescences enlarging at the same time. If divided at this period with a knife, both the bulb and the excrescences, are found to be perfectly solid, and internally to differ little in appearance from a healthy root, except that they are of a more mealy and less compact consistency, and are interspersed with more numerous and larger sap-vessels. The

taste too is more acid, and on this account sheep neglect the diseased plants. Towards the approach of autumn, the roots in proportion, as they are more or less diseased, become gangrenous and rot, and are either broken (as frequently happens) by high winds, or gradually dissolved by the rain. Some which have been partially diseased survive the winter, but of the rest, at this period, no other vestige remains than the vacant patches which they occupied at their first appearance. *This disease is not owing to the seed, nor the time of sowing, nor to any quality of the soil*, either original, or induced by any particular mode of cropping or tillage; and Spence adds, that the most attentive and unbiassed consideration of the facts has led him to infer, that the disease, though not produced by any insect that has been discovered, is yet caused by some unobserved species, which either biting the turnip in the earliest stage of its growth, or insinuating its egg into it, infuses at the same time into the wound a liquid which communicates to the sap-vessels a morbid action, causing them to form the excrescences in question.

It has been recommended by Sir Joseph Banks and others, that *to prevent this disease*, marl should be mixed with the soil, and, if this cannot be procured, mould of any kind which has not borne turnips, such as a dressing taken from banks, ditches, woodlands, &c., and mixed up with a good dose of lime. But lime alone has been tried in vain, and no great dependence can be placed upon fresh mould, as this disease has been known to prevail upon lands that had scarcely ever before borne a crop of turnips. *The anbury* is a disease in the roots of turnips, which is thus described by Marshall, in his *Rural Economy of Norfolk*. It is a large excrescence which forms itself below the apple. It grows to the size of both the hands, and as soon as the hard weather sets in, or it is by its own nature brought to maturity, becomes putrid, and smells very offensively. At present the state of three specimens which have been taken up, and examined attentively is this:—The apples of the turnips are just forming (about the size of walnuts in the husk), while the *anburies* are already as big as the egg

of a goose. They are irregular and uncouth in their form, with inferior excrescences (resembling the lobes of ginger), hanging to them. On cutting them, their general appearance is that of a hard turnip; but, on examining them through a magnifier, there are veins, or string-like vessels, dispersed amongst the pulp. The smell and taste somewhat resemble those of turnips, but without their mildness, having an austere and somewhat disagreeable flavour, resembling that of an old stringy turnip. The tops of those which are most affected, turn yellow, and flag with the heat of the sun, so that in the day-time they are obviously distinguishable from those that are healthy. It seems to be an idea among farmers that the cause of the *anbury* is the soil being tired of turnips, owing to their having been too often sown on the same land. This, however, Marshall says, is positively erroneous, for the piece from which these specimens were drawn, was an old orchard, and never before used for turnips in the memory of man. The cause of this disease is probably not yet well ascertained; but, if drought does not immediately produce it, the coincidence of a remarkably dry season, and a remarkable *anburied* turnip crop, justifies a suspicion, that the former does in some measure contribute to promote the latter. Marshall seems indeed to conceive that it is caused by some kind of grub or other, that wounding the vessels of the tap-root, diverts the course of the sap, which, instead of forming the apple, forms this excrescence.

The canker attacks the roots and partly the bulb of turnips, and is known by the ulcerated appearance it produces. Some consider it owing to the presence of too much iron in the soil, and recommend liming as a preventative. *Wasting and putrefaction* from excess of water or frost are to be prevented by earthing up the bulbs or taking up and storing.

The turnip crop is generally taken and consumed at the same time. They are consumed either on the spot where they grow, on grass-fields, in fold-yards, or in feeding-houses; but the far greater part by sheep. Where they are extensively cultivated, the price per acre, when sold, depends not only upon the weight of the crop, but also upon

the mode of its consumption. *When eaten by sheep in the place of their growth*, turnips are lotted off, by means of hurdles or nets, that they may be regularly consumed. When the first allowance is nearly eaten up, the bottoms or shells are picked out of the ground by means of a two-pronged blunt hook adapted to the purpose; and then another portion of the field is taken in, by shifting the hurdles or nets, and so on regularly until the whole are finished; the cleared part of the field being usually left accessible as a drier bed for the sheep, and that they may pick up what shells remained, when a new portion of the field was taken in. *The turnips required for other modes of consumption*, are usually drawn out at regular intervals, before the sheep are put upon the field; unless the soil be so poor as to need all the benefit of their dung and treading, in which case the whole are consumed where they grow; or so rich as to endanger the succeeding crops, by eating any part of the turnips on the ground. In the latter very rare instance, the whole crop is carried to be consumed elsewhere, as must always be done, if the soil be naturally too wet for sheep-feeding. In wet weather, when sheep ought not to be allowed to lie on the turnip-field, it becomes necessary to carry the turnips to a grass-field; and store-sheep, not requiring to be so highly fed, frequently eat their turnips on such fields, as well as rearing cattle, and sometimes milch cows. A grass-field, contiguous to the turnip-field, is always very desirable, that the sheep confined on other sides by hurdles or nets, may always find a dry place to lie on. *In the distribution of turnips among young cattle*, and amongst sheep in their first year towards spring, when the loosening and shedding of their teeth render them unable to break the large roots, it is usual to cut or slice the turnips, either by means of a spade or chopping knife, or by an instrument constructed for the purpose, called a *turnip-slicer*; or they are crushed by means of a heavy wooden mallet.—*During severe frosts*, turnips become so hard that no animal is able to bite them. The best remedy in this case is, to lay them for some time in running water, which effectually thaws them, or in close feeding-houses, the turnips intended for next day's use may

be stored up over night in one end of the building, and the warmth of the animals will thaw them sufficiently before morning. But in those months, when frosts are usually most severe, it is admissible to have always a few days' consumption in the turnip barn. When a severe frost continues long, or if the ground be covered deep with snow, potatoes ought to be employed as a substitute.

The advantages of eating turnips in the place of their growth by sheep, both in manuring and consolidating the ground, are sufficiently well known to every farmer. Turnips are often let at an agreed price per week for each sheep. An acre of good turnips with straw will fatten an ox of sixty stone, or ten Leicestershire sheep. The turnips are worth, say six guineas; this will be six shillings and threepence halfpenny per week for the ox, and of the sheep to about sevenpence halfpenny each. *The produce of turnips*, cultivated in the broad-cast manner in England varies from five to fifteen tons per acre. In Northumberland and Berwickshire a good crop of white globe turnips drilled weighs from twenty-five to thirty tons. *The produce of the turnips in nutritive matter*, as proved by Sir H. Davy, was forty-two parts in one thousand, of which seven were mucilage, thirty-four sugar, and one gluten. *Swedish turnips* afforded sixty-four parts in one thousand of nutritive matter, of which nine were starch, fifty-one sugar, two gluten, and two extract.

The Swedish turnip is cultivated and used in the same manner as the common turnip, but requires to be sown several weeks earlier, to have plenty of manure, and to be sown on good land. It may be transplanted when young. *The Swedish and yellow turnip* are eaten greedily by horses, and afford a very nutritive and salutary food along with hay or straw for working stock.

ON THE BEET ROOT.

BETA (from *bett*, red, Celtic.)

Class 5, 2. Pentandria Digynia. Nat. Ord. *Chenopodeæ*.

THE FIELD BEET, commonly called the Mangold Wurzel, and sometimes erroneously the root of scarcity, is supposed, by Professor Thaer, to be a mongrel between the red and white-beet. It has a much larger bulb than either.

This root is much cultivated in Switzerland and Germany, both for its leaves and roots, which are given to cattle, or the latter used in distillation, or for extracting sugar.

Mangold Wurzel, or *field beet*, is comparatively but little known at present in England, but has been proved to be excellent food for milch cows, and is in great repute with those who keep large stocks of cows in the vicinity of London, for the purpose of selling the milk. The tops are first cut off and given to the animals, and then the roots. *The cultivation required*, is much the same as that of the turnip. It will grow upon any rich soil. The beet root often yields a very productive crop when the soil is good and suitable for its growth; and being unpalatable for human food, either raw or boiled, it is not liable to the depredations usually committed on turnips and carrots near large towns. *The nutritive matter afforded by the beet* is one hundred and thirty-six parts in one thousand, of which thirteen are mucilage, one hundred and nineteen sugar, and four gluten. According to Von Thaer, the roots afford ten per cent. of nutritive matter, and are in that respect to hay as ten to forty-six, and to potatoes as twenty to forty-six. An acre would thus appear to afford more nourishment than either turnips, carrots, or parsnips. *No plant is less liable to diseases than the beet-root.*

ON THE CARROT.

DAUCUS (*Δαυκος* Dioscor. *Daucus*, Plin. from *daio*, to make hot; on account of its effect in medicine.)

Class 5, 2. Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The characters are—*Corolla subradiate, all hermaphrodite; fruit hispid with hairs; seeds with four rows of flat prickles, and rough intermediate ribs.*

DAUCUS CAROTA (carrot) *seeds hispid, stalks nerved beneath.*

This very useful root was introduced into England by the Flemings, who sought refuge there in the time of Queen Elizabeth. It was certainly known to the ancients, and the wild variety grows in this country. *In its wild state*, the common carrot has a slender, hard, whitish or brownish, fusiform root. It is a common weed, growing in pastures, balks, and head

lands, and is a biennial, flowering from June till August, and is generally known by the name of *birds' nests*, from the appearance of the umbel when the seeds are ripening. The root of the carrot, when cut across, shows an inner whitish circle, which is the wood, and a darker outer circle, which is properly the bark of the root. In both these a considerable proportion of sugary juice is contained; and the carrot may be reckoned of a more nutritious quality than either the cabbage or the turnip. There are several varieties of the carrot, differing in size, and the periods at which they arrive at maturity. Carrots are biennial, and in the second season bear their seed: besides being extensively used as food for man, they are in many places raised in the fields, and employed in feeding horses and cattle. The largest and that best adapted for field-culture, is called the *Altringham*, from a village of that name in Cheshire. Attempts have been made, but without success, to obtain sugar from carrots; a spirit, however, may be distilled from the fermented juice. One ton eight stone, after being exposed a few days to dry, weighed one hundred and sixty stone, and measured forty-two bushels. From this quantity fifty gallons were distilled which were rectified, and twelve gallons of good spirit were obtained; the refuse weighed forty-eight stone, and the wash from the still measured one hundred and twelve gallons, so that the refuse greatly exceeds that of an acre of barley: and an acre of carrots, allowing the produce to be twenty tons, will yield two hundred and forty gallons of spirit, which is considerably more than can be obtained from five quarters of barley. It is only of late years that the carrot has been cultivated for cattle in the fields, although it has been long cultivated in gardens for the table. One acre of carrots, if well planted, will fatten a greater number of sheep or bullocks than three acres of turnips, and the flesh of the animals will at the same time be firmer and better tasted. There is also a material advantage in the cultivation of this root beyond that of the turnip, because the crop is not so liable to fail; for, as the carrots are sown in the spring, the plants generally come up well, and unless the months of June and July turn out very

unfavourable, the crop is almost sure not to fail; whereas turnips are frequently destroyed by the flies at their first coming up, and in dry autumns they are attacked by caterpillars, which in a short time devour whole fields, while the carrots remain unmolested by these vermin. They are also less liable to be damaged by frost and last till April, the season of great difficulty, when farmers frequently know not what to provide for their stock, especially sheep; it being also a spring crop, if the plant fail, the seed only is lost, and the land is in perfect order for turnips at Midsummer; or if scattered plants only be produced, the intervals may be filled by sowing turnips or planting cabbages.

Carrots are also an excellent preparation for barley in sands and sandy loams, that are not foul with *quick* or *spear grass*, for in such lands the hoeing for carrots increases rather than destroys the quick, by hacking it in pieces. No crop, when such lands are clean, can be better for them than carrots, because it admits no summer ploughing whatever, and is put on one earth given with a trench plough in March, so that as much tenacity is given to these naturally loose soils as possible: the crop may be left late in the ground, and if the soil be very sandy, a crop of buck-wheat may follow, for which any degree of cleaning from quick may be given if required.

Every farmer, therefore, who has a stock of cattle or sheep, if he have land proper for the purpose (which must be light, and of a proper depth to admit of the roots running down), should always have a supply of carrots.

To prepare the soil for the carrot, three ploughings are necessary; the first in the beginning of October, that the land may be pulverized by frost, the second in the middle of February in a cross direction, and the third in March, after which the surface of the land must be harrowed smooth and the seed sown. These ploughings should be twelve inches deep. Carrots in *Sussex* are sown after turnips, barley, and pease, set upon a rye grass ley. The climate suitable to the turnip is equally so to the carrot; but their roots penetrate deeper, and they thrive better if it is dry and warm. The soil for carrots should be plentifully manured with good

farm-yard dung. *The season for sowing the carrot is at the end of March or beginning of April. The seed should be prepared by mixing it with earth or sand to cause it to separate more freely. The quantity of seed when sown in rows is two pounds per acre, and for broad casting five pounds, which is by far the most general mode of sowing. The after culture consists entirely of hoeing and weeding. The produce varies from three hundred to eight hundred bushels per acre, thus exceeding the largest crop of potatoes.*

Cart horses may be fed upon carrots and hay in the winter months without any corn. The usual allowance for one horse is seventy pounds per day. Upon this food horses feed very well and are kept in good health. *The produce of one statute acre of land of carrots will keep a horse for a whole year, even if he is kept in constant work. Oxen and hogs may also be advantageously fattened upon carrots. The dung of hogs fed upon carrots is highly prolific. Their produce of nutritive matter, as ascertained, is ninety-eight parts in one thousand, of which three are starch, and ninety-five sugar.*

ON THE PARSNIP.

PASTINACA (from *pastus*, nourishment.)

Class 5, 2. Pentandria Digynia. Nat. Ord. *Umbelliferae*.

PASTINACA SATIVA (garden parsnip). *The parsnip is a biennial plant with a fusiform root like the carrot, and produces nearly as much nutritive and saccharine matter, with a peculiar essential oil, which gives it to many a not unpleasant flavour. It has been principally cultivated in the island of Jersey for fattening cattle and pigs. The best variety is the large Jersey, and the seed should be procured from that island. The variety, called the coquaine, sometimes runs four feet deep, and six inches in circumference. The soil, preparation, and manure, are the same as for carrots. The quantity of seed for sowing in drills is from four to five pounds per acre, and for broad cast six or eight pounds. The time of sowing is usually about the middle of February. The manner of sowing is commonly in drills, at fifteen or eighteen inches distance, but sometimes by broad-casting and harrowing in the*

seed. The after-culture and taking up are the same as for the carrot, only that when broad-cast they should be so thinned as to leave a space of twelve inches between each plant. The produce is greater than that of carrots: they fatten cattle, hogs, and poultry, more expeditiously than any other root, and the flesh of the animals thus fattened, is of the finest flavour and juicy quality. In domestic economy the use of the parsnip is much the same as that of the carrot. The produce in nutritive matter, is ninety-nine parts in one thousand, of which nine are mucilage and ninety sugar. The leaves of parsnips being bulky, may be mown off and given to oxen and horses before the roots are taken up, upon which food these animals will greedily feed. In the island of Jersey, during the winter months, cows are fed upon parsnips and hay, and they yield butter of a fine yellow hue, or saffron tinge, equal to that produced by the most luxuriant pasture. Gerarde says, that a very good bread was made from them in his time. They afford as much spirit as the carrot, and make an excellent wine. In the north of Ireland a sort of beer is brewed from the roots mixed with hops.

PLANTS CULTIVATED FOR LEAVES OR FOR BOTH LEAVES AND ROOTS.—ON THE CABBAGE.

BRASSICA OLERACEA (common cabbage.) *The culture of the cabbage as food for cattle is much more hazardous, far less profitable, and attended with infinitely more trouble than that of turnips. It is nevertheless a very useful plant. The three sorts of cabbage used for field cultivation, are the Scotch, the drum-head, and the American. The first, if it be the true flat-topped firm sort, is never affected by frost, a few of the outside leaves excepted; the true drum-head is said to be hardy, and the heaviest of any for the size; it may be planted closer than the large American; it is called in some places the tallow-leaf, and being too tender to bear very sharp frost, a mixed stock has been procured, by planting this and the common red-cabbage together, and when the seed-pods were formed, cutting down the red, and leaving the other for seed: this mongrel is of a deep green colour, with purple veins,*

retains the size of the drum-head, and has acquired the hardness of the red-cabbage. The *American* comes to a great size, and lasts good very late in the spring: there are many other varieties, as the flat *Dutch*, *Yorkshire*, &c. and the same variety is known under several names in different parts of the country.

The cabbage culture is best adapted to strong land, and comes peculiarly in aid to the farmer, who has not proper soil for turnips. Cabbage succeeds admirably on a rich moist friable loam;—*the tillage for cabbages* nearly resembles that for turnips; they are commonly planted on stubbles, after wheat, barley, oats, or beans; the land is ploughed up at Michaelmas, lies till spring, is then ploughed again three or four times: is manured with from fifteen to twenty-three loads of dung, or else with from twenty to thirty loads of compost, to an acre, before the last ploughing, which lays the land in three feet ridges, towards the end of March or the beginning of April, in which state it must be left for rain to enable the farmer to plant. Some farmers set the plants and others sow the seed of the cabbage.

Many persons think that a crop of cabbage exhausts the land, and that much more so than turnips. A gentleman having tried it for twelve years, on a wet clayey loam, is fully assured that it does not impoverish the soil, but, on the contrary, meliorates and cleans the land, to which it is adapted better than turnips. One acre of his cabbages is often worth three, and sometimes four acres of adjoining turnips, and that on lands five shillings an acre better. The average crop of cabbage is twenty-six tons per acre; of barley after it, thirty-seven bushels; of wheat, thirty bushels; of oats, sixty bushels; and of clover, when mown twice, three tons. *This course of crops* is worthy of notice. When the cabbages are disposed of for the use of cows and other cattle in the straw-yard, and the remainder given to ewes and lambs, the land is sown with barley and clover; and then follow wheat and oats, and after these crops, the land being well dunged, is again fit for cabbages. The land, after cabbages, works better for barley and oats than after turnips.

As to planting, that operation depends upon the weather, and may be performed as soon after the middle of April, as that will admit (cabbages, however, may be planted as late as June), and produce a tolerable crop by November, and in this way they may sometimes be made to succeed an unsuccessful sowing of turnips, but it is in vain to attempt it until there has been a ground rain, and then it must be done as quickly as possible. They must be planted in rows, at such a distance as to afford a full crop, and yet to admit of the weeds between the rows being cleared by the plough, and hand-hoeing must also be used.

The preparation given to the plants consists in pinching off the extremity of their tap-root, and any tubercles which appear on their root or stem, and in immersing the roots and stem in a puddle or mixture of earth and water, to protect the fibres, and pores of the root and stem from drought. The plants may then be inserted by the dibber, taking care not to plant them too deep, and to press the earth firmly to the lower extremity of the root. If this last point is not attended to in planting by the dibber, the plants will either die, or if kept alive by the moisture of the soil or rain, their progress will be very slow. The distance between the ridgelets being twenty-seven inches, and the plants two feet asunder. About six thousand plants are required for an acre. If the seed is sown it must be a month earlier than the planting, on account of clearing the ground from weeds.

The after culture consists in horse and hand-hoeing, and weeding; and the crop is taken by chopping off the heads with a spade, leaving an inch or two of stalk to each. The *produce* is said to be from thirty-five to forty tons per acre. *A cow will eat* from one hundred to one hundred and fifty pounds of cabbage per day, and a sheep ten or twelve pounds, besides a moderate allowance of hay.

In Suffolk, eight or ten acres of the great Scotch cabbage are allowed for the feed of forty milched cows. One good acre of cabbage is said to be sufficient for seven or eight cows, yielding as much food as three acres of turnips, causing the cows to yield more milk and the butter to be of a better quality. One acre of cabbage will nearly main-

tain two hundred sheep for a month, if the crop be good. A middling bullock will eat two hundred pounds of cabbages in twenty-four hours, and therefore a score may be kept on an acre for nearly a month if the produce be tolerably good.

This crop being in perfection in February, March, and part of April, is very valuable to the farmer. Fifteen oxen, weighing when fat nine hundred-weight each, were kept from the fifth of November to the thirty-first of December, being eight weeks, on two acres of autumn sown cabbages, with the addition of four tons of hay; upon the whole, an acre of cabbages is supposed to fatten one beast in four more than turnips, and in two-thirds of the time. Hogs will feed very well on cabbages, and prefer them to turnips. *Thirteen fat wether sheep*, who had nothing else to eat, except what they picked up in open weather on a bare grass-field, consumed one load in a week, that is in the proportion of an acre to twenty-six sheep, for one hundred and twenty days, or more than sixteen weeks. One thousand parts of cabbage gave seventy-three of nutritive matter, of which forty-one were mucilage, twenty-four saccharine matter, and eight gluten.

To save cabbage-seed, select a few fine specimens and plant them by themselves, where they will be in no danger of being contaminated by others of the Brassica tribe, when in flower: the seed will keep many years.

The diseases of cabbages are the same as those of turnips, excepting the forked excrescence, knobs are frequently found upon the roots of cabbages, these should be carefully removed previous to planting.

THE COW CABBAGE rises to the height of from ten to sixteen feet, the leaves are not so puckered nor rolled inwards at the edges, nor do they hang down so much. The stem is naked and simple, crowned by a head of leaves like a palm-tree. *Sixty* plants of this variety are said to afford sufficient provender for one cow for a year, and as the side leaves are only to be used, it lasts four years without fresh planting. In La Vendée this plant is said to attain the height of twelve or sixteen feet. In Jersey the plant is sufficiently hardy, where it grows from four to twelve feet. The little farmers there feed their

cows with the leaves, plucking them from the stem as they grow, leaving the crown at the top. The stems being strong are also used by them for roofing small out-houses. When the gathering of the leaves is finished, at the end of the year, the terminating band or crown is boiled and is said to be particularly sweet. It is not sufficiently hardy to stand the climate of Britain, unless planted in a very sheltered situation.

TURNIP CABBAGE AND TURNIP-ROOTED CABBAGE.

These two plants are sometimes confounded, and indeed they are not essentially different. The first produces its bulb or protuberance, which approaches to roundness, chiefly above ground, but in the second it is oblong and descends into the ground.

The turnip-cabbage, though said not to be so hardy as the other, yet withstood the severe winter of 1788-9, when most of the turnips were destroyed. *It is suitable for the table* when young, about the size of a moderate garden turnip, and those which are sown in June will continue good all the winter. The root must be stripped of its thick fibrous rind, and then it may be treated as a turnip. The largest roots are twenty-three inches in circumference, and weigh upwards of twelve pounds. *Their chief use*, as well as that of the turnip-rooted cabbage, *is for feeding cattle and sheep*; their culture is the same, and their principal excellence is their hardness.

The manner of cultivating these plants in the field is much the same as that of the cabbage. Sow a pound of seed very early in March for every three acres intended to be planted. *Prepare the land* by three or four earths, the first given at Michaelmas. Before the last earth manure as for turnips. Finish the whole ready for planting by the first week in June. The first ground rain after that, set all hands to *planting*, the rows two feet asunder, and the plants eighteen inches apart in good land, and twelve inches in poorer soils. *Plough* the intervals three times, and keep the rows perfectly clean by hand-hoeing. When the plants are to be taken up, plough the rows without a coulter, and a round share with a blunt edge.

Others sow broad-cast, and hoe out as

for turnips. Others, again, sow the seed in drills in the middle of April, where it is to remain, having observed a great difference between the plants left in the seed-bed, and those planted just beside them, to the advantage of the former. When they are sown broadcast, they should be put in earlier, because they are longer in coming to the hoe than turnips.

This crop is in no danger from the fly, and if it be attacked by caterpillars or slugs, they may be checked by rolling very early in the morning.

Turnip-rooted cabbage will produce from twenty-five to thirty tons per acre, and for late spring-feed it is certainly a most valuable crop. It is invulnerable to frost, and when farmers are distressed for sheep-feed in April, furnishes an unfailing supply, and affords abundance of milk for the lambs. It is a firmer and more substantial food than turnips, and may be kept long out of the ground. Every farmer should therefore cultivate so much of this root as will insure him provision for his cattle and sheep three or four weeks in the latter part of the spring, unless he has other provision for them.

If the ground be wanted for barley, the turnip-rooted cabbages may be ploughed up in February or March, and spread on a ley or dry pasture, or else stacked up. They are of so firm a nature as to keep good out of the ground near twelve months, through the extremes of heat and cold. On light land buck-wheat may be sown on the first earth, upon the land from which they are fed off, and the clover or other seeds may be sown with it in the same manner as with oats and barley.

ON THE TARE.

VICIA SATIVA (common tare, fetch, or vetch). The tare is a valuable agricultural plant, and has been cultivated for its stems and leaves rather than for its fruit or seeds, which are only used for feeding pigeons from time immemorial. The common tare is distinguished into two sorts, the *winter* and *spring* tare. It is the opinion of an eminent botanist that they are the same plant; but, though this may be true of the tare in its natural state, there is reason to believe that a material difference now exists, superinduced perhaps by cultivation.

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The winter tare (it appears by the experiments detailed by the above author), escaped injury from frosts that destroyed the spring variety. The difference in the size of the seeds is, however, so inconsiderable as to be scarcely distinguished; but "the winter tare vegetates with a seed-leaf of a fresh green colour, whereas the spring tare comes up with a grassy spear of a brown dusky hue." But, whatever the difference may be, it is evident that the seeds of the two sorts ought to be kept separate, since each sown out of its proper season is found not to prosper. Many farmers in Middlesex, especially near London, grow a few acres of tares, for soiling horses and feeding milch cows, and the culture of them has been extended every year since their importance has been understood.

Tares may be made the principal means of enabling the arable farmer to support as much live stock as the grazier. During the time they occupy the ground, they produce more green food of the best quality than the finest pastures, and the ground may be cleared of them in the month of June, in such time as to admit of loamy sands producing a crop of clear turnips in the same year, and of clayey loams being prepared for and sown with wheat.

They support cattle well, and will make both sheep and bullocks of every size and breed, fat: but it is necessary, however, to restrict the quantity of this kind of green food, as it may produce cholic if given in a wet state and in too large quantities. It would be well, when in this state, to mix oat-straw with it as a corrective. Tares enrich every situation, and flourish on all sorts of soils. They do not depend on a market, and above all, they manure the land fit for the immediate reception of turnips, whereby a succession of green crops can be kept up, that would fat a very increased quantity of live stock, and be the means of raising in situations, the most distant from towns, an abundance of dung. A judicious combination of tares with turnips, clover, and saintfoin, may be the means of rendering poor sheep-walks, downs, and wastes, of from ten to thirty times their present value to the community.

In choosing between the spring and winter tare every thing must depend on the intention of the crop. If an early

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feed is desired, the winter variety is preferred, but where a late crop, or a crop for seed is required, then the spring variety will deserve the preference. *The time of sowing* for the winter variety is generally in September or October, and for the spring variety as early in the year as the season will permit. *The mode of sowing tares* is mostly broadcast, which should be performed as evenly as possible over the surface of well-prepared land; the seeds being afterwards covered in by good harrowing. It will be proper to guard the field for several days against the depredations of pigeons, who are remarkably fond of tares, and who will pick up a great part of the seed, unless constantly watched. *The quantity of seed* required to an acre, is from two and a half to three and a half bushels, according as they are consumed green, or left for seed. *If cultivated for seed*, they should be sown in rows, at four feet distance, and should be dropped thin in the rows, as the stalks send out branches, extending to a great length.

A little rye sown with winter tares, and a few oats with the spring sort, not only serve to support the weak creeping stems of the tares, but add to the bulk of the crop by growing up through the interstices. *The after culture* consists merely in pulling out the larger weeds, and, when they are in rows, the horse or hand-hoe is applied. *In reaping tares for soiling*, they ought always to be cut with the scythe. When mown early, they will in a moist season produce three mowings, but generally two. *The produce of tares cut green* is ten to twelve tons per acre, and when made into hay, about three tons per acre. *The produce in seed* is from three to six sacks. *The diseases of tares* are so few as to be of no consequence; a crop is sometimes but rarely lost by mildew.

ON THE CULTURE OF HERBAGE PLANTS.

The cultivation of clovers and other herbage plants, used exclusively as food for live stock, is comparatively a modern improvement. They were known to the Greeks and Romans, and cultivated from a very early period in the low countries, but do not appear to have attracted much notice in Britain until the sixteenth century, when our frequent intercourse with Holland led to the introduction of some of our best

field plants and agricultural practices. At present clovers enter largely into the succession of crops, on all soils, and in every productive course of management. Lucerne and Saintfoin, though of much less value as general crops, are yet valuable crops on dry chalky and limestone soils, where most other agricultural plants, and even grasses, would hardly maintain their existence.

The clovers are a numerous family, chiefly natives of Europe: those selected by the agriculturist are natives of Great Britain. *The species of clover* in cultivation are the red clover (*Trifolium pratense*), a biennial, and sometimes, especially on chalky soils, a triennial plant, known from the other species by its broad leaves, luxuriant growth, and reddish purple flower. In its wild state a perennial. The white, or creeping Dutch clover (*T. repens*) a perennial plant, known by its creeping stems and white flowers. This is one of the most valuable of the grasses where a flock of sheep is kept; as they and other cattle feed eagerly upon it, and are speedily fattened. It is a sign of good land, that naturally produces this plant. That which comes up spontaneously by the application of manure, is said to be much more hardy, than that which is sown as well as more lasting in the soil. The yellow clover (*T. procumbens*) an annual, known by its procumbent shoots and yellow flowers. It is but seldom cultivated. The meadow or cow clover (*T. medium*) resembles the red clover, but of a paler hue, dwarfer habit, and with long roots, that are very sweet to the taste. It is also called by some farmers *marl grass*, and affords a very luxuriant herbage; more lasting than the common red clover. On clayey and strong loamy soils its growth is certain, and good crops have been produced from sandy soils. It is difficult to procure the seed genuine; and advantageous to sow it with other grasses where the land is to be continued in a state of pasturage. The flesh-coloured clover (*T. incarnatum*) grows all the winter, and early in spring affords abundant food for sheep; or if left till May, presents a heavy crop for the scythe and may be used for soiling, or making into hay. It should not be sown with corn like other clovers, because it grows so fast as to choke them.

It is a subject of astonishment that this valuable plant should not long ago have been introduced into this country, and cultivated on an extensive scale. If sown in autumn, after a crop of potatoes or other roots, it produces next spring a crop fit to be cut for feeding cattle eight days earlier than lucerne, and a fortnight before red clover. Care, however, must be taken to have good seed, and not to sow it too deep. It produces two excellent crops in one year; the first of which should be cut as soon as it comes into flower; and the second will produce a considerable quantity of seed. From its early growth in spring, when other articles for feeding stock with advantage are so difficult to be obtained, it is likely to become a valuable acquisition to British husbandry. It is proper to observe, that this is an annual plant, and should therefore only be employed in partial husbandry.

In the choice of sorts, the red or broad clover is the kind most generally cultivated. *The soil best adapted for clover* is a deep sandy loam, which is favourable to its long tap roots; but it will grow in any soil, provided it be dry. *The preparation of the soil and manures*, which the clover receives in ordinary farm culture, are those destined also for another crop; a certain proportion of rye-grass mixed with the clover, being generally sown along with or among corn crops; such as spring-sown wheat, barley, and the early varieties of oats. The soil requires to be well pulverized, and to have been some years under tillage, as newly broken-up leys or pasture-grounds must be thoroughly comminuted, and the roots of former grass-plants to be completely destroyed previous to its being suitable for clovers. *The time of sowing clover-seeds* is generally from February to May; but when sown by themselves, from August to October, will be found the best season, as the young plants will then be less liable to injury from the usual hot and dry weather of July. *The preparation of the seed for sowing* is generally by steeping it in oil or water, and then mixing it with powdered gypsum, as a preventative from the attacks of insects. *The mode of sowing* is always broad-cast. Some consider it best to sow the clover and rye-grass separately,

immediately after land has been pulverized by harrowing in the corn-seeds, and are themselves covered by one course more of the harrows. Half an inch is reckoned the most advantageous depth in clay-soil; but an inch in that which is light or loose. *The quantity of seed sown* on an acre, varies from eight to fourteen pounds of clover, mixed with a bushel of rye-grass; particular attention as to their quality and cleanness should be paid in the selection. The purple colour of the clover-seed denotes that it has been ripe and well preserved, but it is extremely difficult to discover or separate the seeds of noxious weeds that are frequently mixed with rye-grass. *The after-culture* consists chiefly of picking off stones, and in cutting out docks or other large weeds. The surface should be rolled once (about March) to smooth it for the scythe. Some give a top-dressing of soot, gypsum, common lime, peat, or wood-ashes, at this time, or earlier. *The taking of the clover and rye-grass crop*, is either by cutting green for soiling, by making it into hay, or by pasturing. *Soiling* is a term applied to the practice of cutting herbage crops green for feeding or fattening live stock. In feeding cattle with green clover care must be taken to prevent swelling or hoving, which is very apt to take place when they are first put on this food. It is never safe to allow milch cows to eat large quantities of wet clover. *The making herbage plants into hay*, is a process somewhat different from that of making hay from natural grasses. *This sort of herbage* ought always to be cut as close to the ground as possible, and the soil having been previously cleared of any stones that might impede the scythe, and also rolled with a heavy roller, admits of mowing being performed in a very uniform and perfect manner, unless the crop be lodged, or broken down by wind. Whatever part of the stems is left by the scythe, is not only lost, but the after-growth is neither so vigorous nor so weighty, as when the first cutting is taken as low as possible.

Clover and rye-grass are commonly all mown in June, though in the north sometimes not till near the end of July. *The time of mowing* must, indeed, be determined by the growth of the plants, but it is a common error to allow them

to stand too long. They should in every case be cut down before the seeds are formed, that their juices may, as much as possible, be retained in the hay. When the stems become hard and sapless, by being allowed to bring their seeds towards maturity, they are of little more value as provender, than an equal quantity of the finer sort of straw or corn. *One of the best among the various modes of hay-making, at least for clover and rye-grass, may be described in a few words. As soon as the swath is thoroughly dry above, it is gently turned over (not tedded or scattered), without breaking it. Sometimes this is done with the hand, or by a small fork, and some farmers are so anxious to prevent the swath from being broken, that they only permit the use of the rake-shaft. The grass, when turned over, in the morning of a dry day, is put into cocks in the afternoon. The mode of performing this is very simple and expeditious; and none but women, boys, and girls, under the eye of a confidential servant, are usually employed. If the crop is heavy, a row of cocks is placed in the middle ridge of three, and if light, of five ridges. A distinct company of carriers and rakers is allotted to every such number of ridges; and the separate companies proceed each on its own ground, in the same manner as in reaping grain, which occasions a degree of competition among them for dispatch, clean raking, and neat well-built cocks. The carriers gather the hay, and carry it to the ridge where the cock is to be built, by one of the most experienced hands. A raker follows the carrier, taking up and bringing to the cock the remains of the swath. There are, in general, five people employed about each row of cocks; a carrier and a raker on each side of the ridge on which the cocks are placed, and a person on the ridge who builds them. But when the crop is not weighty, more rakers are required as a greater space must be gone over. As the cocks are thus placed in a line, it is easy to put two or more into one afterwards; and the larger cocks may be speedily drawn together to be put into tramp-ricks, by means of ropes thrown round their bottoms, and dragged along by a horse. It is impossible to lay down any rules for the management of hay, after it is put*

into cocks; one thing is, however, always attended to, not to shake out, scatter, or expose the hay oftener than is really necessary for its preservation. Sometimes the cocks have been put up so large, that they never required to go to a tramp-rick, but were carted to the stack-yard, without ever being broken, and put up in alternate layers with old hay. But where this is attempted there must not be much clover. The practice of mixing the new with the old hay, is very good, and saves a great deal of time and labour; the old hay is also much improved by it. *The best managers disapprove of spreading out the swaths of clover and rye-grass, as is the case with other grasses. The more the swath is kept unbroken, the greener and more fragrant is the hay. The after-growth or second crop of clover is vigorous or weak, according to the proportion of clover-plants to rye-grass, to the time when the first crop was cut, and to the moisture and warmth of the season. The produce of clover-hay, without any admixture of rye-grass, is from two to three tons per acre. The weight of hay from clover and rye-grass varies from one to three tons per acre. The diseases of clover are the blight, mildew, and suffocation or consumption from insects, slugs, or worms.*

ON LUCERNE, BURNET, AND SAINTFOIN.

These green crops have often been greatly extolled, but the small progress hitherto made in their cultivation, abundantly justifies the conclusion meant to be drawn, *viz.* that the climate of the British isles is unfriendly to their growth. In fact, with none of them will the like weight of crop be obtained as with good clover and rye-grass; and, this being the case, it need not excite wonder that agriculturists should continue to use the plants which yield them the most bountiful return, and avoid exotics not suited to our climate.

The ancient Roman writers speak much in commendation of *lucerne* (*Medicago sativa*), by them called *Medica*; but whether it had this name from being used as a medicine for sick cattle, or because it was originally brought from the kingdom of Media, is uncertain. Columella states, that one sowing will last for ten years, and that it ought to

be cut four, often six times in a season. He adds, that it enriches the land, fattens all kinds of lean cattle, is a remedy for those that are sick, and that one jugerum (three-fourths of an English acre), will completely feed three horses for a whole year. Palladius speaks nearly to the same purpose in its praise, and so does Pliny, with this difference, that he asserts it will last thirty years. These, to be sure, are important matters, though we entertain doubts whether such crops as are mentioned by these writers could at this time be realized in the climate of Italy, far less in the inferior one of Great Britain. When M. Du Hamel, a great admirer of lucerne, speaks of feeding horses of an ordinary size, with five or six pounds weight of it per day, we are almost tempted to smile. The writings of this gentleman, and his friend M. Lulli de Chateauxvieux, are amply filled with commendations of this plant.

Lucerne requires a very deep, friable soil, inclining to sand, with a subsoil of a similar character. It is sown, either in drills or broad cast, in March or early in April, and sometimes along with barley; the quantity of seed being from fifteen to twenty pounds if sown in the latter way, and from eight to twelve in the former. It must always be kept free from weeds, and should be top-dressed with dung or other manure, at least every five or six years. Some prefer giving it a slight dressing every spring. It is consumed in much the same way as clover, either in a green state, or after being made into hay. In some very favourable situations it admits of being cut five times in the course of the summer. It is an excellent food in its green state, both for horses and milch cows. Though it can never come into our rotations like *red clover*, on lands kept under an alternate course of corn and green crops, not attaining its most productive state in a single year, yet it may be introduced upon those soils which require to be kept from the plough, and in pasture for several years, before they are restored to tillage; and it may possibly in time become so inured to our climate, as to answer in parts of the island where it is now thought unlikely to succeed.

In favour of *Burnet* not much more can be said than of *lucerne*. *Saintfoin*

(*Hedysarum onobrychis*) has, however, been sown more extensively than *burnet*, and with much greater success, on dry, warm, chalky loams, and gravelly soils on a calcareous bottom. It is more adapted to hay than pasture; and much heavier crops of this grass are obtained from thin land than when clover is sown. In short we consider *saintfoin* to be a hardy kind of grass, well worth the attention of farmers in upland districts, where the soil is obdurate and shallow, and where clover and ryegrass can with difficulty be raised to such a height as to stand the scythe. When sown (which should be in February or March), fresh seed ought constantly to be used, as the vegetation of old seed cannot be depended upon. Four bushels may be used for an acre; sometimes along with barley or other kinds of grain; and great care ought to be taken to cover the seed well, and to put it deeper into the ground than the seeds of other grasses. *It is ready for being mown* the second year, and may last from seven to ten years, though it is in its greatest perfection in about three years. *The produce* in hay is from one and a half ton to two tons per acre. It is mown for soiling or hay, or pastured in the same way as clover. If the crop is chiefly taking off by mowing, it must be occasionally top-dressed with manure or peat ashes. This plant is exceedingly wholesome for horses, and is esteemed one of the best sorts of food for cattle, especially in the spring, nor is there any danger attending the use of it, as there is in clover. It produces abundance of milk, and butter made of that milk is very good. Since it has been introduced into England, many dairy farms have been set up, where it was formerly impracticable: and if this plant was properly cultivated to such an extent as it might be, not only a much greater quantity of milch cows could be maintained, but a greater number of black cattle might be fattened, and more sheep and hogs, which would be a great improvement to many estates in hilly counties; for, by increasing the live stock, there will be an addition of manure for dressing the land in proportion. *Saintfoin* is allowed on all hands to be an admirable improvement on limestone rocks and chalk downs; which in order to be cultivated to the greatest advantage, should be in this

course, with no more arable than is necessary for the change.

Modern authors affect to write *sainfoin*, as if the term meant *wholesome hay*; whereas it is called *sainfoin*, or holy hay, from a presumption of its superior excellence.

ON FARM DRAINS.

We propose here to treat, only of such drains as farmers make for themselves. These may be divided into such as are best suited to soils rather loose, and incohesive, and such as are best adapted to alluvial clays or soils of an uniform and close texture.

With regard to the first sort of drains, the practice is to cut them in such a situation as to catch the spring before it oozes out of the subsoil, and spreads itself over the surface. In common language the line of the drain commences between "the wet and the dry," and is of such a depth as may be necessary to get down to the porous or sandy subsoil from which the spring emerges. In general from two and a half to three and a half feet may be a sufficient depth, and where the spring is not found at the latter depth, tapping or boring may be resorted to. *These drains* are cut about the breadth of the spade at bottom, and opened no wider at the surface than is necessary to give room to the labourer to work, which may usually be from fifteen to eighteen inches. *The best material for filling them up with* is small round stones, which are usually to be got from the surface of the land itself; but a variety of other materials are occasionally employed, such as furze, broom, and even straw, in situations where stones cannot be readily procured. If the water is expected constantly to flow along the bottom of the drain, care must be taken in laying the stones at the bottom, by forming a sort of arch, or by building up either side a few inches, and laying flat-stones as a coping above, leaving a clear space for the stream below. But in most cases it is sufficient to select small round stones for the bottom, which are thrown in promiscuously, the interstices, as in the case of gravel, allowing the water to percolate freely through them. When the drain has been filled up to within ten or twelve inches of the surface, the stones are covered with turf or sod, the grassy

side undermost, and then the earth that was taken out of the drain is thrown above it, until it comes to the level of the surface. It is obvious that to insure the free working of these drains, they must never be disturbed by the plough, and therefore the covering of earth should be always somewhat deeper than the plough works.

On alluvial or clayey soils, not infested with springs, the evil is necessarily somewhat different, and acquires a different remedy. Here the soil is of itself tenacious of moisture, and does not allow the rain-water to pass freely through it. On such soils it may be thought that covered drains can be of little use, but long experience has proved their efficacy.

The mode of making the drains has been thus described in a communication to *The Highland Society of Scotland*. "The work is performed by means of three spades of different sizes. The first may be a common spade of moderate breadth, with which the surface clay may be taken off to the depth of eight or ten inches, or not quite so much if the clay be very strong. The breadth of the drains at the top may be from a foot to fifteen inches, but it should never be less than a foot, as it is an advantage for the sides to slope considerably—and the two sides should slope as equally as possible. Another workman follows the first, with a spade six inches broad at the top, and becoming narrower towards the point, where it should not exceed four inches. The length of the plate of this second spade should be fourteen inches, and with it, a foot or fourteen inches in depth can easily be gained. A third workman, and he should be the most expert, succeeds the second, and his spade should be four inches broad at the top, only two inches broad at the point, and fourteen or fifteen inches in length. With this spade a good workman can take out at least fifteen inches of clay. A sort of hoe or scoop, made of a plate of iron, formed nearly into the shape of a half cylinder, of two inches diameter, and a foot or fourteen inches long, and fastened at an acute angle of perhaps *seventy* degrees to a long wooden handle, is now employed to scrape out the bottom of the drain and remove any small pieces of clay that may have fallen into it. *This*

completes the cutting, of what is called by the workmen a three *stamp* drain. Where it is required they may be made of four, five, or more *stamps*. In general, drains should be at least three feet deep, and where the levels admit of it, it would be more advantageous to make them four feet deep. In all cases it seems best to put a drain in every furrow, although some farmers put only one in every second furrow."

In filling these drains turfs matted with the roots of coarse grasses is considered the best material. "The turfs should be cut into an oblong shape, four inches and a half broad, and from three to five inches thick. They are generally made about fourteen inches long. The grassy side of the turf being turned undermost, they are put down into the drain, the workman standing upon them after they are put in, and pressing them down with his whole weight till they are firmly wedged between the sloping sides of the drain. The ends of the turfs being cut somewhat obliquely, they overlap each other a little; and by this means, although there is a sufficient opening for the surface-water to get down, nothing else can. *The open space* below the turf ought to be about five or six inches in depth, three inches wide at top, and one and a half, or two inches, at bottom. *When the turfs* have been properly put in and trodden down, the operation may now be completed by turning in as much earth either with the spade or plough, as to fill up the drain to the proper level. *The expense of draining per acre* depends on the breadth of the ridges; when these are of fifteen feet, it will cost about 2*l.* 17*s.* per acre."

Currents of water that will not admit of covered drains must be left open; but in this case the water may be carried by covered drains into the fence ditches, instead of leaving them open in the middle of the field. A ditch forms part of the fence wherever the white thorn or other live hedges are employed for that purpose. *Drains should be formed with as much truth and exactness as possible*, and labourers who are dexterous in the use of their tools should be employed in making them. *When there is any declivity in the ground*, drains should be made in a slanting direction across it, instead of the old method of conducting them

according to the nature and inclination of the slope. By attending to the former mode of cutting the drains, the wetness is not only more effectually removed, but by allowing the water to pass away in an easy current, they are rendered less liable to be choked, or as it is frequently termed blown up, by which artificial oozings of water are sometimes formed in such places. *The depth of drains* must depend upon the nature of the soils, the positions of the land, and a great variety of other more trifling circumstances. *Cutting the drains as narrow as possible*, which has of late been much practised, is of importance, as it causes a considerable saving of the materials employed in filling them up, whether wood or straw, but in cases where bricks or stones are used this cannot be too much attended to; however a greater width than about a foot is seldom necessary, provided the stones be coupled at the bottom, or thrown in in a mixed way, nor more than sixteen inches when laid in the manner of a sough or channel; but, of whatever depth the materials may be, the earth or mould by which they are covered up should not be less in depth than a foot, in arable land it should be more.

IMPLEMENTS AND MACHINERY.

No country in the world is better provided with implements for executing rural labour than Great Britain, and to this superiority may in some measure be attributed the increased and increasing perfection of agriculture over the whole island. The numerous implements of tillage-husbandry may be arranged under these *six* heads,—such as are employed, *first*, in preparing land for sowing; *second*, in depositing the seed; *third*, during the growth of the plants; *fourth*, in reaping and securing the crop; *fifth*, in preparing it for market; and, *sixth*, in the general purposes of a farm. But, as the same implement is sometimes used for more than one purpose, it would be of little consequence to adhere strictly to this or any other arrangement.

ON PLOUGHS.

The plough is an instrument of such importance in agriculture, that, in all ages it has held the first place among the implements of that art; nor is there

any nation mentioned in history, who have attempted to cultivate the ground without it, excepting some barbarians destitute of every art and science, and even these have used something equivalent; some turning up the ground with the horns of oxen, and some with other things equally unfit for the purpose. These rude and barbarous attempts only show the great usefulness of the instrument proposed to be treated of.

At a period so near our own times as the conquest of Peru, the inhabitants of that devoted country were found by the Spaniards in the situation we have described; every thing was done by manual labour, without any assistance from beasts of draught or burden: they turned over the earth with an instrument like our shovel and afterwards dibbled in the grain; and even now there are many nations whose knowledge of agriculture is not greater. The inhabitants of Chili make use of a piece of wood, of a crooked shape, something like our plough, with which they turn over the soil; the seed is then sown and covered, by dragging bushes over it in place of harrows. In the province of Lithuania, a part of ancient Poland, the plough is of the same rude construction, and in many other parts of the Russian Empire they are not in possession of any better instruments. To come nearer home, the ploughs of the Shetland and Faro Isles, and of Ireland, are as bad, and their agriculture equally imperfect.

As the operation of ploughing, like many other operations in practical husbandry, must often vary in the manner of its being performed, it is evident that no one particular sort of plough can be superior to all others, in every season, and under every variety of soil or inclination of surface. It would neither be of much utility, nor at all consistent with our limits, to describe all the numerous varieties of form. *The Scotch plough*, however, and the variations of which it is susceptible, render it by far the most universal tillage implement hitherto invented or used. *Ploughs are of two kinds*: those fitted up with wheels and called *wheel-ploughs*, and those without wheels called *swing-ploughs*. *In the construction of ploughs*, whatever be the sort used, there are a few general principles that ought invariably to be

attended to, such as making that part of it which perforates and breaks up the ground of a long, narrow, clean, tapering sharpened form, so as to offer the least resistance in passing through the land. The beam and muzzle should be so contrived, as that the moving power, or team may be attached to the most advantageous line of draught, which should always be at right angles to the horses' shoulders. *The materials* with which ploughs are constructed, are generally wood for the beam and handles, cast iron for the head, side-plates, mould-board, and sole, and wrought-iron for the share, coulter, and muzzle.

SWING PLOUGH.

The Northumberland plough and the *Berwickshire plough* are very nearly the same implements, the mould-board being less concave than in *Wilkie's swing plough*. The best iron swing plough in Scotland is formed entirely of iron, except the points of the handle. *Finlayson's Kentish skeleton self-cleaning plough*, is intended as a substitute for the common Kentish turn-wrest plough, as the soil in great part of Kent is of a peculiarly adhesive nature. *The Somerville swing plough* is known by its mould-board, a part of which is rendered moveable by hinges: the advantage of this is, that the furrow can be laid more or less flat at pleasure. *Gray's turn-wrest swing plough* is one of the most scientific implements of the kind. *Weatherly's moveable still plough* is characterised by certain joints in the stilts, which admit of raising or lowering the handles at pleasure, so as to suit the height of the ploughman: they also admit of taking off the stilts, for the convenience of packing. *Duckett's skim-coulter plough* is said to be a valuable instrument, though not much in use. It opens the ground to any depth, ploughs clean, turns down the roots of the grass, and covers them with fresh earth. *The double share plough* is distinguished by having one share fixed directly over the other. It is made use of in some of the southern districts with advantage, in putting in one crop immediately after ploughing down another; as by it a narrow shallow furrow is removed from the surface, and another from below placed upon it, to such depth as may be thought most proper. *The mining plough*, or *trenching plough*, is

sometimes employed for the purpose of loosening the soil to a great depth, without bringing it up to the surface—a mode of operation which is particularly useful for various sorts of tap-rooted plants, as well as for extirpating the roots of such weeds as strike deep into the ground. *Somerville's double-furrow plough* is obviously advantageous in performing more labour in a given time, with a certain strength of team, than other sorts of ploughs, as producing two furrows at a time. *The Argyleshire plough* differs from *Small's*, or any single swing plough, in having no coulter fixed in the beam, but, in lieu of this, a fin or knife, rising from the left side of the share, which serves the purpose of slicing off the furrow as well as the coulter. *The double mould-boarded plough* is a kind of plough often used with advantage in clearing out furrows, in setting potatoes, cabbages, and other similar crops, and in earthing up such as are planted in wide rows. Those whose mould-boards move on hinges, and may be set wide or narrow at pleasure, are the most convenient. *The Binot* is almost the same thing as the double mould-boarded plough, and the one is commonly sold for the other, with no loss to the purchaser. It has two mould-boards, one on each side of the beam. *The marking plough* is used in straightening and regulating the distance of ridges where the drill system is practised. *Clymer's plough* is a recent modification of the implement formed entirely of iron, and chiefly remarkable for the absence of the coulter, or rather its attachment to the breast; and for the share mould-board, and other parts which move under ground, being composed of distinct pieces of cast iron. *Stothard's plough* is characterized by a perforated mould-board. The holes may be in any form or dimensions; and their object is to allow the air to pass through, and thus prevent the adhesion of wet earth, which it is contended adheres to ordinary ploughs, with such a degree of tenacity as greatly to increase the friction, and diminish the speed of the horses. *Morton's trenching plough* has two bodies; the one working four or six inches deeper than the other. The first cuts or pares off the surface to the required depth, say five inches, and turns it over into the furrow, ten or twelve inches deep,

made by the main body. The second body generally works from ten to twelve inches deep. It has on the mould-board an inclined plane; and this inclined plane raises the soil from the bottom of the furrow, and turns it over on the top of that which has been laid in the bottom of the previous furrow, by the body going before.

WHEEL PLOUGHS.

Wheel ploughs are of two kinds, those (and which are by far the most common) where the wheel or wheels are introduced for the purpose of regulating the depths of the furrow, and rendering the implement more steady to hold; and those where the wheel is introduced for the purpose of lessening the friction of the sole or share. This last description of plough is scarcely known, but it promises great advantages. *Ploughs with wheels for regulation and steadiness*, vary considerably in their construction in different places, according to the nature, of soils, and other circumstances; but in every form, and in all situations, they probably require less skill in the ploughman. Wheels seem indeed to have formed an addition to ploughs, in consequence of the want of experience in ploughmen; and in all sorts of soil, but more particularly in those which are of a stony and stubborn quality, they afford great assistance to such ploughmen, enabling them to perform the work with greater regularity in respect to depth, and with much more neatness in regard to equality of surface. *The improved Scotch plough, with one or sometimes two wheels* fixed near to the end of the beam, without any carriage, goes very light, and is very useful. Where two wheels are employed, the plough does very well without a holder, on a good tilth or light sward, where there are few stones, except at the setting in and turning out. *The Beverston plough* was once considered a good wheel plough. *The Kentish and Herefordshire wheel ploughs* are extraordinary clumsy implements of very heavy draught, and making, especially the former, very indifferent work. *The Norfolk wheel plough* has a clumsy appearance, from the great bulk of its wheels and their carriage; but in light friable soils it does its work with neatness, and requires only a small power of draught. *Wilkie's single horse wheel*

plough was invented by the late Mr. Wilkie. The wheel of this plough, besides considerably reducing the weight of draught, is found to give a degree of steadiness seldom equalled in the use of the common plough. *Wilkie's improved friction wheel plough* for two horses, was invented by the late Mr. Wilkie in 1825, and is manufactured by his son at Uddingston, near Glasgow. We consider this as by far the most perfect implement of the plough kind that has hitherto been produced. *The paring wheel plough* is of various forms, though it is an implement seldom required. It is used for paring the surface of old grass lands, or leys on clay soil, where the turf is to be burned. *Clarke's draining plough* was found to answer well in meadow ground, near Belford in Northumberland, but could not be drawn in stiff clay with the force of eight horses. *Morton's draining plough* has three coulters, two mould-boards, and one share. *Gray's chaining plough* seems one of the best: the beam is strongly fortified with iron. *The gutter plough* is used for forming gutter drains in grass lands, where the soil is of a retentive nature. The power of six horses is required in drawing it the first time; but four horses are found sufficient for opening the old gutters. *The mole plough* was invented by Adam Scott, and improved by Lumbert, of Gloucestershire. It is said to be an implement which, in ductile soils, may be of considerable benefit in forming temporary drains. — *The Duke of Bridgewater's draining plough* is used for making open drains of a small size regular shape, and from five to nine inches deep. The share has a coulter fixed to it, projecting upwards, to cut one side of the drain; and another coulter fixed to the beam, and also to the share at its lowest end. The turf which is thus cut out, passes between the coulter and the mould-board, and is thus lifted clearly out of the trench. The depth of the drain is regulated by the wheels at the fore end of the beam. This plough is drawn by four or six horses. *Various draining ploughs* have been invented and tried by Arbuthnot, Makie, M'Dougal, Green, Pearson, and others.

The only essential plough to be selected is the *improved Scotch swing plough*, with or without one or two wheels, according to circumstances; and

with the mould-board, share, and coulter, set to suit different soils, as flinty, chalky, &c., or soils in different states of culture, as old turf, heath, steep banks, ley, &c.

ON HARROWS.

These beneficial implements are of various sizes and dimensions. The object of harrowing being both to drag out, quicken weeds, and to cover the seed when sown; it is obvious, that implements of different sizes are not only necessary, but even that these implements should be worked in different ways, according to the strength and condition of the soil on which they are employed, and the nature of the work to be executed. It may also be remarked, that on rough soils, harrows ought to be driven as fast as the horses can walk, because their effect is in direct proportion to the degree of velocity with which they are driven. In ordinary cases, and in every case, where harrowing is meant for covering the seed, three harrows are the best yoke, because they fill up the ground more effectually, and leave fewer vacancies than when a smaller number is employed. The harrow-man's attention, at the seed process, should be constantly directed to prevent these implements from riding upon each other, and to keep them clear of every impediment from stones, lumps of earth or clods, and quickens or grass roots; for any of these prevents the implement from working with perfection, and causes a mark or trail upon the surface, always displeasing to the eye, and generally detrimental to the braird or vegetation of the seed. Harrowing is usually given in different directions; *first*, in length, then across, and *finally*, in length as at first. Careful husbandmen study, in the finishing part of the process, to have the harrows drawn in a straight line, without suffering the horses to go in zig-zag manner; and are also attentive that the horses enter fairly upon the ridge, without making a curve at the outset. In some instances, an excess of harrowing has been found very prejudicial to the succeeding crop; but it is always necessary to give so much as to break the furrows and level the surface, otherwise the operation is imperfectly performed.

The harrows most generally used are

of an oblong shape, each containing twenty tines, five or six inches long beneath the *bulls* or *bars* in which they are inserted. It is still common for every harrow to work separately, and though always two, and sometimes three harrows are placed together, each of them is drawn by its own horse. The great objection to this method is, that it is scarcely possible upon rough ground to prevent the harrows from starting out of their place and *riding* on one another. To prevent this inconvenience, the exterior bulls of each are usually surmounted by a frame of wood, raised so high as to protect it from the irregular motions of its neighbour; but in many instances they are connected by chains, or hinges, or cross bars, which is a preferable plan. Another objection which is made to the common harrow, is, that the ruts made by the tines are sometimes too near, and sometimes too distant from one another. *The drag* may be called a large harrow, and the harrow a small drag. Their destination, however, is in some respects different. The drag being weighty and strong, and tines large, is employed to go over first the fallow or rugged land, to tear the large and heavy clods in pieces, and loosen the mould which adheres to them. After the field or ground has lain some time in this state, and the sun and air have somewhat pulverized the soil, and withered the grass and weeds, then a pair of harrows are to follow still further to fine down the mould, and to bring up all rubbish to the surface, where it lies either to wither and be burnt to ashes, as manure to the ground, or be carried off to form some mix of compost or manure as may be most convenient to the farmer.

Brake drag.—This is a large and weighty drag, calculated to work upon links newly inclosed and broken up. It consists of four square bulls, each side five inches, and six feet and a half in length. The teeth are seventeen inches long, bending forwards like a coulter. Four of them are inserted into each bull, fixed above with a screw-nut, having twelve inches free below, with a heel close to the under part of the bull to prevent them from being pushed back by stones. *Chain and screw drag*.—This is a valuable implement on many occasions, and particularly in harrowing ridges. *Lord Somerville's*

cart drag.—This is a new invention of his lordship's, which promises to be of considerable utility in husbandry. It requires only a single horse to work it, and is calculated to carry thirty-five hundred weight. *Harrow with shafts*.—This implement is used only in the drill husbandry, being calculated for covering the seed deposited in the drills, the horse going in the furrow. *Jointed brake harrow*.—This harrow has twenty-four teeth, shaped like coulters, and standing at about an angle of eighty degrees. By this instrument the land is finely pulverized, and prepared for receiving the seed from the drill. It requires four horses in stiff, and two in open land. *Angular weeding harrow*.—This is calculated to follow the brake when necessary. *Curwen's weed harrow*.—This is the invention of John Christian Curwen, Esq. M. P. of Workington Hall, Cumberland. It is calculated for cleaning weeds from all crops in the drill-husbandry, which it does with singular facility. The simplicity and ease with which it is worked is a great recommendation; a man and boy with one horse being able to clear above seven acres of corn per day. *Quadruple harrow*.—This implement consists of four distinct harrows linked together by chains. It is intended for breaking the surface of newly-inclosed grounds, where much labour is required. *Knight's harrow*.—This harrow is constructed with two joints. The *angular-sided hinged harrow* is one of the best implements of the kind, as it both operates on the ground with great regularity, and is less liable to ride or be deranged in turning than the common, or the rhomboidal harrow. The improved *Scotch* or *rhomboidal* harrow consists of two harrows joined together, they are generally made heavy or light, according to the purpose for which they are intended, or the nature of the ground on which they are to be employed. *The grass-seed harrow* is only a lighter construction of the rhomboidal harrow, or of any other approved form. *The brake or levelling harrow* is a valuable implement. It consists of two frames, the one triangular, and the other oblong. *Gray's seed harrow* for wet weather promises to be useful in certain situations, as in a tenacious retentive soil and moist climate. *Morton's revolving brake harrow*

is a very powerful implement in strong clayey soils infested with couch. *The only essential implement of the harrow kind is the rhomboidal.*

ON ROLLERS.

The roller is constructed of wood, stone or cast-iron, according to convenience, or the purposes for which it is to be used. For tillage lands, the roller is used to break the lumps of earth, and in some cases to press on and make firm the ground about newly-sown seed, on grass lands it is used to compress and smooth the surface, and render it better adapted for mowing. The common roller is employed for the common purposes of reducing soils, and for rolling wheat or other crops in the spring, and for grass-seeds. The parted cast-iron roller was invented to remedy the inconvenience experienced in the use of the common implement, in turning at the ends of ridges or other places, where, from their not moving upon their axis, but being drawn along the surface of the ground, they are liable to bear it up, and make depressions before the cylinder comes again into the direct line of draught, and at the same time they are not brought round without great exertion in the team. The spiky or compound roller is occasionally employed in working fallows, or preparing stiff bean-land for wheat. The only essential roller for general purposes, is the parted cast-iron roller, with a scraper and box over.

ON CULTIVATORS OR GRUBBERS.

The use of pronged implements, as substitutes for the plough, is comparatively of recent invention. They differ from the plough, in stirring the soil without reversing its surface or altering its form; unless, indeed, in some cases they tend to even or level inequalities: they act both as the plough and harrow at the same time; and on suitable soils, and at proper seasons, much more labour is effected with less expense of men and cattle. Wherever, therefore, lands require to be stirred for any purpose, excepting that of reversing the surface, or laying them into beds or ridges, recourse may be had to pronged tillage implements, such as we are about to describe. The Scotch scarifier, cultivator, or grubber, is considered one of the best implements of this kind, as a substitute for

the plough. It consists of two strong rectangular frames, the one including the other, and nine bars mortised into the inner one, with eleven coulters, or prongs, with triangular sharp-edged dipping feet, four cast-iron wheels, and two handles. All the cutters are fixed in these bars except two, which are placed in the side beams of the outer frame, and may be set to go more or less deep, by means of pins and wedges. Weir's improved cultivator is a very effective implement of this kind, with nine coulters or prongs. It may be set to go more or less deep, by raising or lowering both the fore and hind wheels. Parkinson's cultivator has been found a very useful implement, both for stirring and cleaning land. Hayward's cultivator, or, as it is called, extirpator or scalp plough, is used on land already ploughed. It pierces about two inches deep at each operation. Beatson's cultivator is recommended by the inventor for its lightness; it effects, by reiterated application, what is done by the large Scotch cultivator at once, by which means a saving of power is obtained, but with a loss of time as is usual in all similar cases.

ON HOES.

Of horse-hoes there is a great variety, almost every implement-maker having his favourite form. They are useful for stirring the soils in the intervals between rowed crops; especially turnips, potatoes, and beans. Respecting the construction of horse-hoes, it may be observed, that soils of different textures will require to be hoed with shares of different forms, according to their hardness, or mixture of stones, flint, or gravel. The Scotch horse-hoe has three hoes or shares, and is drawn by a single horse. The Northumberland horse-hoe is of a triangular form, and contains three coulters, and three hoes, or six hoes, according to the state of the soil. Wilkie's horse-hoe, and drill plough, is considered an effective implement. The mould-boards are taken off when used as a horse-hoe; and the hoes taken off, and the mould-boards replaced, when earthing up the crops; thus combining, in one implement, a complete horse-hoe, and double mould-board plough. Blaikie's inverted horse-hoe consists of a line of coulters set in a beam, and this beam attached to the axle of a pair of

common wheels. It hoes several rows at once; and instead of being straight, the coulters are all curved or kneed, and set back to back, so as to include a row between each pair. *Morton's universal drill plough and harrow* answers both as a double mould-board, plough, and a horse-hoe; is much approved of in the culture of drilled crops; and, with some slight attention, it may also be employed as a small plough for taking the earth from the sides of the ridges. *The thistle-hoe, or hoe-scythe*, is an invention by Amos. "It is used," he says, "for the purpose of cutting over thistles, and other injurious weeds in pasture lands." In the execution of the work, it not only greatly reduces the expense, but executes it in a much closer manner than by the common scythe. One man and a horse are said to be capable of cutting over twenty acres in a day.

ON HORSE-RAKES.

Raking machines are not in very general use; but where corn is mown, they are successfully employed in drawing together the scattered stalks, and are also of great use in hay-making. The saving in both cases consists in the substitution of animal for manual labour. *The common, or Norfolk horse-rake*, is employed for barley and oat crops, and also for hay. One man and a horse, driven by means of a line or rein, are capable of clearing from twenty to thirty acres in a moderate day's work; the grain being placed in regular rows or lines across the field, by simply lifting up the tool, and dropping the grain from the teeth, without the horse being stopped. *The horse stubble rake* is a large heavy kind of horse rake, having strong iron teeth, fourteen or fifteen inches in length, placed at five or six inches from each other, and a beam four inches square, and eight or ten feet in length. In drawing it two horses are sometimes made use of, by which it is capable of clearing a considerable quantity of stubble in a short time. *The couch-grass rake* differs little from the last, and is employed in fallowing very foul lands, to collect the couch-grass or other root weeds. *Weir's improved hay or corn rake* is adjusted by wheels, and is readily put in and out of gear, by means of the handles and bent iron stays. It is drawn by one horse in shafts, and is a very effective implement.

The hay tedding machine, invented about 1800, by Salmon of Woburn, has been found a very useful implement, especially in making natural or meadow hay, which requires to be so much more frequently turned and thinner spread out, than hay from clover and rye grass. It is drawn by one horse, and, on the whole, answers as a tedding machine perfectly. In the neighbourhood of London, where meadow hay is so extensively made, it is found to produce a great saving of labour, and is now coming into very general use.

ON DRILL MACHINES.

The purpose of these ingenious, but often too complicated, machines, is to deposit the seed in equidistant rows on a flat surface, on the top of a narrow ridge, in the interval between two ridges, or in the bottom of a common furrow. Corn, when drilled, is usually sown in the first of these ways, turnips in the second, and pease and beans in the third, or fourth. *Cooke's improved drill and horse-hoe*, though not the most fashionable, is one of the most useful implements of this kind on light dry soils, even surfaces, and in dry climates. It has been much used in Norfolk and Suffolk, and many other parts of England. It can be transformed into a cultivator, horse-hoe, scarifier, or grubber; it may also be made to rake corn stubbles, or clean land of root-weeds. When corn is to be sown in rows, and the intervals hoed, or stirred, we know of no machine superior to this; and few can be made so cheap. But these advantages, though considerable in the process of drilling, are as nothing when compared with those which arise from the use of the horse-hoe, with which from eight to ten acres of land may be hoed in one day, with one man, a boy, and one horse, at a trifling expense, in a style far superior and more effectual than any hand-hoeing whatever; also, at times and seasons when it is impossible for the hand-hoe to be used at all. *The Norfolk drill*, or improved lever drill, is a corn drill on a larger scale than Cooke's, as it sows a breadth of nine feet at once: it is chiefly used in the light soils of Norfolk and Suffolk, as being more expeditious than Cooke's, but it also costs about double the sum. *Cooke's three row corn drill*, is the large machine in a diminutive form,

and is exceedingly convenient for small demesne farms, where great neatness is attended to. It can be used as a cultivator, hoe, rake, &c. like the other. *Of turnip drills*, the best is the improved Northumberland drill. The roller which goes before the seed has two concavities, and thus leaves the two ridges in the very best form for the seed; after these are sown, two light rollers follow and cover them. It is drawn by one horse, sows two rows at once, and seldom requires to be repaired. *French's turnip drill* is the most perfect implement of the kind. He invented the concavities in the turnip rollers. Concave rollers and curved coulter may be considered as two of the greatest improvements that have been made in the machines used in turnip culture, since that root was first cultivated in drills. Besides the improvement of the concave rollers, this machine is easily put in and out of gear by means of a lever. It contains two hoppers. The seed and manure, when deposited in the gutter traced by the coulter, is covered by two small flat rollers, as in the Northumberland drill. *The Northumberland one row turnip drill* has two wheels, which run in the hollows on each side of the drill or ridge to be sown; by which means the sower is enabled to keep the row exactly in the centre of the drill. The ridges are previously rolled either by a common or concave roller, the latter being preferable. A recent improvement in this machine is the addition of a hopper, for pulverized manure, over which a barrel of water might easily be suspended, if deemed requisite. *Of Bean drills* there are three kinds, all equally good: one for sowing in prepared drills, or after the plough, which is pushed by manual labour; one attached to a light plough, which draws a furrow in prepared soil, and sows a row at the same time; and one which can be fixed between the handles of any common plough for the same purpose. *Weir's expanding bean drill*, to sow four rows, is affixed to a pair of wheels and axle, in the manner of Cooke's drill. The axle which passes through the drill boxes has four moveable brushes and cylinders, by which means any widths, within that of the axle, can be given. Where ground is prepared and ribbed, and where there is not a Cook's drill on the premises, this

machine may be resorted to with convenience. *Weir's manuring one row turnip drill* is a remarkable improvement of the Northumberland implement. It has a manure hopper, and a seed hopper, the same as the other; but the manure, instead of being dropped along with the seed, is deposited in a deep gutter made by a coulter, which goes before; this manure is covered by a pronged coulter, which follows the other; next comes the coulter, which forms the gutter for the seed: the seed is thus deposited about one inch above the manure. One roller of the concave kind goes before the machine, and another light one of the common kind follows after it; or without attached rollers, the drill may be affixed to one side of the common roller behind, which roller may prepare one drill, and cover the seed sown on another course. *A horse dibbling machine for beans* has been invented; but being rather complicated in its movements, it will require considerable simplification before it can be recommended. *The block plough drill* is an equiangular triangular block, thirty inches to a side, with cast-iron scuffler teeth, and wooden blocks slipped over them. A field being laid up in ridgelets with this implement, is next sown, broad-cast with wheat and bush-harrowed, by which the grain rises in rows as accurately as if sown with the drill. *The drill roller* is so contrived as to form regular incisions or drills in the ground, at proper depths for the seed. It is merely a common roller, mostly of iron, usually seven feet long, about which are put cutting wheels of cast-iron, that turn round the common cylinder, each independently of the others, which cylinder generally weighs about a ton. It is drawn by three or four horses abreast, and driven by a man elevated behind them: the cutting wheels being moveable, may be fixed at any distance; but from four to six inches is the space commonly allowed. *The drill watering machine* is an implement of recent invention. The machine consists of a barrel mounted upon a cart-frame, which discharges water from a ball stop cock, having four mouths, which communicate by means of a leather hose, with four horizontal tubes, shut up at the end by a screw, which admits of the tube being cleaned. As the quantity of water let out by the

apertures is less than what is received into the tubes, the tubes are always full; by which a regular discharge is kept up from all the apertures at the same time. As the machine advances, the streams which fall from the first aperture upon the plants, is followed up by a stream from all the apertures in the tube; therefore each plant must receive all that is discharged from twenty apertures. *Supposing the barrel to contain two hundred gallons, and the tubes to be five feet long, the diameter of the tubes three-eighths of an inch, and the diameter of the apertures in the tubes to be one-sixteenth of an inch, two hundred gallons will be discharged from eighty such apertures in two hours and twenty minutes.*

ON THRESHING MACHINES.

The threshing machine. is the most valuable implement in the farmer's possession, and one which adds more to the general produce of the country than any invention hitherto devised. *Threshing and preparatory machines* include threshing and winnowing machines, and smut machines. They are worked by horses, water, wind, and, of late, by steam, and their powers and dimensions are adapted to the various sizes of the farms. Water is by far the best power; but as that, in many cases, cannot be obtained, and as wind and steam are too expensive, horses are generally employed. Machines thresh cleaner than the flail, and one machine will thresh more than a great number of labourers with flails. The first effective machine upon a large scale, was constructed by a Mr. Meikle, in Scotland, in 1786. All well constructed threshing mills have one winnowing machine, which separates the chaff from the corn before it reaches the ground; and a second sometimes receives it from the first, and gives it out ready for market, or nearly so. With a powerful machine driven by water, corn is said to be threshed and dressed at no more expense than must be incurred from dressing alone, when threshed with the flail. The corn is more completely detached from the straw; and being threshed so much more expeditiously than by the flail, a good deal of it may be preserved in a bad season which would have been spoiled in a stack. *The specific advantages of threshing machines* may be thus enumerated; *first*, one-twentieth part more corn is gained from the straw than

by the old fashioned method; *second*, the work is done more expeditiously; *third*, pilfering is avoided; *fourth*, the grain is less injured; *fifth*, seed-corn for sowing is easily procured from the new crops; *sixth*, the markets are more readily supplied in times of scarcity; *seventh*, the straw softened by the mill is more useful for feeding cattle; *eighth*, if a stack of corn be heated, it may be threshed in a day, and the grain, if kiln dried, will be preserved and rendered fit for use; *ninth*, the threshing mill does not break the smut ball; *tenth*, by the same machine the grain may be separated from the chaff and small seeds, as well as from the straw. *The advantage that the public would derive, if threshing mills were universally employed in every case, has been thus estimated:—*

The number of acres producing grain in Great Britain	8,000,000
The average in quarters, at three quarters per acre	20,400,000
The increased quantity of grain produced by threshing mills instead of using the flail at one-twentieth part of the produce	- 1,200,000
The value of that increased quantity at 40s. per quarter	£2,400,000
The saving in the expense of labour at 1s. per quarter	£1,200,000

The smut machine is the invention of Hall, late of Ewell in Surrey, now of the Prairai in the United States. It resembles that used for dressing flour, and consists of a cylinder perforated with holes, in the inside of which are a number of brushes, which are driven round with great rapidity. The wheat infected with smut is put into the cylinder by a hopper, and the constant friction occasioned by the rapid motion of the brushes, effectually separates the smutty grain which is driven out through the holes of the cylinder. Hall found that it required much more power to clean wheat by this machine than to dress flour. A machine on this construction might be a very useful appendage to every threshing machine, for the purpose of effectually cleaning all wheat intended for seed, or such wheat meant for the market as had much smut in it. *To take the awns from barley*, where a threshing machine is used, a notched spur, lined on one side with plate iron, and just the length of the rollers, is fixed by a screw bolt at

each end to the inside cover of the drum, about the middle of it, so as the edge of the notched stick is about one-eighth of an inch from the arms of the drum as it goes round. It rubs off the awns completely.

ON REAPING MACHINES.

An implement capable of performing the process of reaping corn, is yet a *desideratum* in agricultural machinery, but which will probably be supplied, at least for favourable situations, at no distant period. Those who remember the general opinion, when the threshing-machine was first advertised, will not be sceptical concerning the success of a machine for reaping corn; though no doubt the latter, like as it happened to the former, will require many years, and many alterations, before it can be brought to be completely and generally useful. *The first reaping-machine* is thus described. This machine was placed in a two-wheel carriage, somewhat resembling a common cart, but the wheels were fixed upon the axle so that it revolved along with them. A cog-wheel within the carriage, turned a smaller wheel at the upper end of an inclined axis, and at the lower end of this was a larger wheel, which gave a rapid motion to a pinion fixed upon a vertical axis, in the fore-part of the carriage, and rather on one side, so that it went before one of the wheels of the carriage. The vertical spindle descended within a few inches of the surface of the ground, and had there a number of scythes fixed upon it horizontally. This machine when wheeled along, would, by the rapid revolution of its scythes, cut down a portion of the corn growing upon the ground over which it passed, but having no provision for gathering up the corn in parcels, and laying it in proper heaps it was wholly unsuited for reaping. The reaping-machine was improved by Mr. Smith, of the Deanston cotton works, Perthshire, North Britain, in 1815. A Scotch acre (one and a quarter acre English) of beans was cut down with ease in an hour and a quarter. The trials made with it on wheat, though not extensive, were satisfactory, and in reaping oats the corn was laid down in the most satisfactory manner. It will cut about an English acre per hour. The cutter during the hour must be sharpened four times with a common scythe stone.

A machine costs from thirty to thirty-five pounds. If properly managed, it will last for many years, requiring a new cutter every two or three years, the cost of which would be but trifling. *The most recent attempt at improving the reaping-machine* is that by Mr. Patrick Bell, A. M. His machine was tried at Gowrie, in the county of Forfar, in September, 1829, in cutting down oats, barley, and wheat, on ground of uneven surface and considerable declivity. It is about five feet broad, and consequently cuts down this breadth of corn as it moves onward. The stubble left was from three to four inches high, and the corn cut was deposited as the machine advanced in a very regular manner. It was worked by one horse and costs thirty pounds, the work being done at about the rate of an imperial acre in the hour. In the opinion of the farmers, and others present at this trial, this machine would come immediately into general use, and confer a signal benefit on agriculture.

The Flemish or Hainault scythe has been tried at different times, and recommended as a better implement for reaping corn than the sickle or scythe in common use. A man will cut with this instrument two roods, or half an acre a day, and the saving has been calculated as equal to about one-third of what would be required to cut the same crop by the sickle now in use. Still, however, the most common implement for reaping is either the *teethed-hook*, or the *smooth sickle*, sometimes called the *scythe-hook*. It has been disputed which of these is preferable. The sickle cuts the straw like the scythe, and where the crops are strong, there can be no doubt that the work is performed with much less labour, and the crop taken up equally clean as by the teethed-hook. But, where the crop is thin and straggling, some of the stalks drop to the ground as they are cut, instead of being gathered and taken up, as they would have been by the teethed-hook.

CHAFF-CUTTER.

The chaff-cutter is used for cutting hay, or straw into fragments, not larger than chaff, to facilitate its consumption by cattle, there are numerous forms, one of the most common is that which is so formed that in case of its being accidentally broken it may be repaired by any common mechanic. The pres-

sure of the straw is also capable of being regulated with great facility. But the great improvement is in having applied a special groove instead of the endless screw, by which friction is much diminished, and the lever may rise to any height without putting the machine out of work. *The turnip-slicer*, a tool of a similar description, is partially used for cutting turnips, which is often an advantageous practice, especially in feeding sheep of a year old in spring, after they have cast their first teeth.

ON WHEEL-CARRIAGES USED IN HUSBANDRY.

Waggons, though they may possess some advantages over carts in long journeys, and when fully loaded, are in fact of no benefit in agriculture, being much less convenient for the general purposes of a farm, and particularly on occasions which require great despatch, as in harvesting the crop. *Waggons* constructed in different forms, and of various dimensions, are made use of in different districts of the kingdom, and mostly without much attention to the nature of the roads, or the articles which are to be conveyed by them, being in general heavy, clumsy, and inconvenient. *The Gloucestershire waggon* is said to be the best in England. By means of a crooked side rail bending archwise over the hind-wheel, the bodies or frames of these waggons are kept low, without the diameter of the wheels being much lessened. The bodies are likewise made in proportion to their shallowness, and the wheels run six inches wider than those of most other waggons, whereby advantages in carrying top loads are evidently obtained. *The Berkshire waggon* is constructed on a simple and convenient principle, not having the usual height or weight of other waggons, while it possesses sufficient strength, and is easy in the draught. An improvement suggested is that of leaving the space sufficiently deep in the body, or bed for the fore-wheels to lock round in the shortest curve, as in its present construction a great deal of time is lost in turning at the end of the swaths in carrying hay and on many other occasions. *Road's patent waggon* is a contrivance whereby the same carriage may in a few minutes be changed by the driver into two complete tip-carts of

the common dimensions, and applicable to all the uses of carts in general, or into one waggon, so complete that a narrow inspection is necessary to distinguish it from a common waggon. It costs above five pounds more than two ordinary carts. *Carts*, like other instruments, vary in their forms and modes of constructions according to the nature and situation of the roads, and many other local circumstances, but, for the purposes of farming, those of the single-horse kind are in general the most advantageous and useful. *Carts drawn by one or two horses* are the only farm carriages of some of the best cultivated counties, and no other are ever used in Scotland. Two-horse carts are still the most common amongst farmers in Scotland.

CAUSES OF THE SUPERIORITY OF BRITISH AGRICULTURE.

The causes of the superiority of British farming to that upon the Continent of Europe arise, first, *From the security of property*.—In Britain, every man may be said to possess in security, the full fruits of his industry, and may use and appropriate them in any way he pleases, that is not injurious to his neighbour; secondly, *Beneficial nature of the tenures under which property is held*.—*The granting of leases* by landed proprietors to their tenants is mutually beneficial; for as it must always be to the interest of the proprietor to have his estates well cultivated, so the 'occupier of the soil being secured in his occupancy for a given period, is encouraged to improve the soil to the utmost of his ability; thirdly, *The general diffusion of wealth*, when judiciously and appropriately applied by the farmer, enables him to make great improvements which the poor farmer is unable to do, although the latter will cultivate every portion of the soil to the best of his ability, and this he will be compelled to do, from a principle of necessity; fourthly, *The partial use of machinery and an attention to implements of husbandry*.—Threshing and winnowing machines are now in very common use, and likewise machines for breaking and grinding grain for horse food. Much improvement has likewise been made in the construction of ploughs, harrows, rollers, machines for drilling, and in carts, waggons, &c. The machinery and

the agricultural implements used in Britain are made much stronger than those upon the Continent; and perform their various operations much more successfully and effectually. This will especially apply to threshing machines; fifthly, *The education bestowed upon farmers* has greatly improved and enlarged their minds, and they are willing now to listen to suggestions of improvement, although this was not formerly the case. The printing-press and the Board of Agriculture have been instrumentally useful in diffusing throughout the land the beneficial effects resulting from the practice of experienced agriculturists. In proportion to the attention bestowed upon the education of farmers may improvement hereafter be expected to advance. A man of uncultivated mind may hold a plough, or harrow the land in a proper manner, but he will not be likely to improve the system of culture, for it is always difficult to persuade an uncultivated mind; sixthly, *The intimate connexion between corn and grass husbandry* has been very beneficial to British farming. In no country, with the exception of Flanders, is this union so close as in Britain; and, notwithstanding the invincible prejudices of many landed proprietors against the breaking up of old grass lands, it has been satisfactorily proved that alternate husbandry is the very best mode that can be adopted. *But the practice of alternate husbandry, or of pasturage and tillage in their respective turns*, cannot generally prevail until *this absurd but deep-rooted prejudice, that old grass lands must not be disturbed by the plough* be totally removed. The foregoing reasons all combine to render the agriculture of Britain superior to that upon the European Continent; and as all ranks and classes of men in the community depend for their subsistence upon the produce of the soil. "The king himself being served by the field," it is the bounden duty, as well as interest of the whole body politic, to unite in removing the causes which obstruct improvements in agriculture, whatever they may be. It seems also to be incumbent upon a *wise and paternal government* to enforce by legislative enactments, the proper cultivation of all waste lands, not only for the purpose of increasing the quantity of corn raised,

but also as the most profitable mode of employing a *superabundant and starving population*. The cultivators of the soil should be unshackled in their operations by restrictive clauses in leases, and permitted to till the land in the best mode that their experience and observation dictate, so as to raise the largest and most productive crops that the earth will yield. With regard to *waste lands*, it has been wisely observed, that "if all of them were properly cultivated, they would be more valuable than the whole of our *West India possessions*." That one-sixth part of our own soil should remain uncultivated, whilst so many millions of money have been profusely spent to retain possession of islands at the distance of thousands of miles from our native shores, is no proof of the wisdom of the legislature.

ON LEASES.

Holding land under a lease is a very ancient tenure in Britain, although the nature and terms of leases have materially changed since this kind of tenure was first established. *The necessity of the occupier of the soil retaining his farm upon a lease* is evident, as much time is required and much money must be spent to bring a farm into proper order. A well-digested plan will require a long period to enable the farmer to carry it into full effect. The best land must sometimes be laid down with grass, and summer-fallowing will be necessary to destroy the weeds. A farmer who sets earnestly to work to improve his farm, will find that almost twenty years must elapse before he can reap the benefit of his improvements. What security of possession then has he, or what incentive to improve a farm which is only rented from year to year, and of which he at any time may be *dispossessed at six months' warning*? *The very improvements* which he has made may induce some covetous neighbour or designing steward to dispossess him; but if this man held his farm upon a lease he would have an inducement to improve it *for his own sake*. Leases are commonly for seven, fourteen, or twenty-one years. The late Lord Kames has suggested the propriety of an indefinite or perpetual lease. Leases in Scotland are usually made for

twenty-one years, and it was suggested by his lordship that leases should be renewable after that period upon certain terms to be agreed upon between the landlord and tenant. It is not necessary to specify the particulars of these terms, only it may be observed generally, that whatever be the precise nature of the terms upon which the lease is renewed, they *must always* be such, as will make it *quite evident* to the farmer, that *it will be to his own personal advantage to improve the farm to the utmost of his ability, in such a way as to raise the greatest crops.* Whatever landlord acts upon a principle contrary to this, will sooner or later find himself *miserably disappointed.* An additional argument in favour of long or renewable leases is, every farmer knows from experience, that the proper manner of cultivating land is only to be learned from an intimate acquaintance with the nature of its soil, and that what is very good management upon one farm may be very bad upon another. This knowledge can only be acquired by actual experience, and to gain this, time is requisite. Leases should not only, in the first instance, be made for a term of twenty-one years, and renewable upon certain specified conditions, but they ought to be *unrestrictive* in their nature, so as to allow the farmer the benefit of his skill in cultivating the land according to the best of his judgment. It is true that these covenants must contain certain general rules of management; such as keeping the farm in good order, to consume all the straw raised upon it, and to sell no dung. Every good farmer, for his own sake, will readily regard these general rules; and in leases of sufficient length, the property of the landlord should be protected by restricting clauses, for the three years previous to their expiration, and the occupier of the land should leave a proportional quantity of it in grass at the expiration of the lease, which must specify how the land is to be sown down. As the landed proprietor can seldom farm his own lands to advantage, it is necessary when he puts them under the management of others, to invest these persons (generally called tenants), with discretionary powers, or, in other words, with powers to do every thing respecting their cultivation, which

he himself could have done, or how can he expect to receive the full natural value of his property under the name of rent? It is, however, a fact, that in general, proprietors of land are very reluctant to give a discretionary power to the cultivator of the soil, although restrictions must ultimately injure the landlord; for it is evident, that whilst on the one hand the landlord is anxious that his estates should be brought into the best possible state of cultivation, by which their value will be enhanced; so, on the other hand, it will be the interest of the farmer to make the land he occupies as profitable as he can to enable him to pay his rent.

ON THE RENT OF LAND.

In ancient times, the rent of land consisted in a certain part of the articles produced. In those days both money and markets were scarce; but as the country increased in prosperity, both markets and money became more plentiful, and the rent now consists of a fixed price in money. Tenants in England have other burdens to bear besides the actual rent paid to the landlord; such as land tax, poor's rate, tithes, road work, church dues, constables' dues, &c. These taxes, at the present time, together with the high rent of farms, press so heavily upon the principal farmers in some villages, as to *absorb the whole proceeds of their farms, leaving nothing for the support of their families.* In Scotland the taxes upon the farmer are lighter. One half of the schoolmaster's salary, one half of the poor's rate, and the commuted value of work statuted to be performed on the public road; the amount of these is trifling, rarely exceeding two *per cent.* of the rental. The greater freedom enjoyed by the cultivators of the soil in Scotland, and the superiority of that system which connects them with the landlord, have caused the art of agriculture to advance with greater rapidity in Scotland than in England. *The present tithe system in England is universally allowed to be very oppressive and injurious to the farmer, and, indeed, to the nation at large, as it throws a great quantity of land out of cultivation. Nor does the evil stop here; but its effects are of a very demoralizing nature, and a most fruitful source of animosity, bickering, and bad feeling be-*

tween the clergy and their parishioners; the former *exacting and enforcing the payment with rigour of the very highest tithe the law will admit of*, which in some cases is so enormous that the farmers *cannot pay it, and actually live in terror of, and at the mercy of, the vicar*. It cannot, then, be any matter of surprise, that with high rents, short leases filled with restrictive clauses, oppressive taxes, and heavy tithes, agriculture should be depressed, and that it does not flourish as it might and assuredly would do if these things were altered and ameliorated. During the late war, the prices of all kinds of grain *were unnaturally high*; but since the peace of 1815, there having been no fair proportion between the rent of land and the price of grain, many of the farmers have been entirely ruined. The landlords have exacted high rents, the government has oppressed the farmer with taxes, and the clergyman with tithes, and the farmer thus oppressed has *trodden down the poor labourer "like mire in the streets."* The fact is that the proprietor of the soil, the occupier or tenant, and the labourer employed by the latter, *have all a mutual interest*, and whenever they are all brought to understand this, and act accordingly, *then will agriculture flourish*.

AGRICULTURAL ZOOLOGY.

Though horses, neat cattle, sheep, and swine, are of equal importance to the British farmer with corn crops, yet we have few treatises concerning these animals, compared with the immense number that have been written on the management of arable lands, or the crops produced upon them.

Whether this difference of attention proceeds from an erroneous preference of the plough, or whether it is owing to the ignorance of agriculturists respecting the properties of live stock, we shall not stop to consider. The fact is, however, as we have stated it; though, according to the present improved system of farming, there is such a connexion between the cultivation of the ground and the breeding, rearing, and fattening of domestic animals, that the one cannot be neglected without injury to the other.

Though so little has been written concerning the domestic animals of Britain, it deserves to be remarked,

that the *improvement of those animals* has not been neglected; on the contrary, it has been studied like a science, and carried into execution with the most sedulous attention and dexterity. We wish it could be stated, that one half the care had been applied to the selecting and breeding of wheat and other grains, which has been displayed in selecting and breeding the best proportioned and most kindly feeding sheep. A comparison cannot, however, be made with the slightest degree of success; the exertion of the sheep-farmers having, in every point of view, far exceeded what has been done by the renters of arable land. Even with cattle, considerable improvement has taken place. With horses, those of the racing kind excepted, there has been but little improvement; and as to swine, an animal of great benefit to the farmer, in consuming offal which would otherwise be of no value, very little improvement has been effected in the different breeds.

EQUUS CABULLUS (the wild and domestic horse). *Distinguished by a long flowing mane, and the tail wholly covered with long hairs.*—This generous and serviceable creature possesses the courage of the lion, the fleetness of the deer, the strength of the ox, and the docility of the spaniel; by his aid men become more acquainted with each other; he not only bears us through foreign climes, but likewise labours in the culture of our soil, draws our burdens and ourselves, carries us for our amusement and our exercise, and both in the sports of the field and on the turf, exerts himself with an emulation that evinces how eagerly ambitious he is to please and to gratify the desires of his master. He is lively and high-spirited, yet gentle and tractable, vigorous and active, keen and ardent in his exertions, yet firm and persevering. He seems equally qualified for all the different purposes for which men can wish to employ him; he submits peaceably to the draught, exults in the race, disdains every obstacle in hunting, and on the road advances cheerfully with his master, for whom he conceives the attachment of a companion. He is both our slave and our guardian; he gives profit to the poor, and pleasure to the rich; in our health he forwards our concerns, and in our sickness lends his

willing assistance for our recovery. This fine, this spirited animal, participates with man the toils of the campaign, and the glory of conquest; penetrating and undaunted he views dangers and braves them, accustomed to the din of arms, regards it with enthusiasm, seeks it with ardour, and seems to vie with his master in his animated efforts to meet the foe with intrepidity, and to conquer every thing that opposes itself to his matchless courage. In war he performs every evolution with the utmost dexterity, and displays a degree of ardour for battle which the courage even of the bravest soldier cannot excel.

“The glory of his strength is terrible. He paweth in the valley, and rejoiceth in his strength; he goeth on to meet the armed men. He mocketh at fear and is not affrighted; neither turneth he back from the sword; the quiver rattleth against him—the glittering spear and shield. He swalloweth the ground with fierceness and rage, neither believeth he that it is the sound of the trumpet. He saith among the trumpets Ha! Ha! and he smelleth the battle afar off, the thunder of the captains and the shouting.”

But for the domestication and services of the horse, we should have yet been far behind in civilization; and, without him, our luxuries would have been greatly limited. By his aid the labour of inland agriculture is much lessened, commercial intercourse is facilitated, and mankind transported with speed to distant parts.

Of all other animals, the form of the horse is the most perfect and elegant, and highly adapts him for speed; while his pliability of physical organization, and his extreme docility of disposition, render him a willing and obedient servant of man. Daubenton remarks, that of all animals the horse seems the most beautiful; the noble largeness of his form, the glossy smoothness of his skin, the graceful ease of his motions, and the exact symmetry of his shape, have taught us to regard him as the first, and as the most perfectly formed; and yet, what is extraordinary enough, if we examine him internally, his structure will be found the most different from that of man, of all other quadrupeds whatsoever. As the ape approaches us the nearest in internal conformation, so the horse is the most re-

mote—a striking proof that there may be oppositions of beauty, and that all grace is not to be referred to one standard. Horses have been so long known in a domestic state, and their useful qualities have caused them to be diffused so generally over the globe, that it is impossible to discover with any degree of certainty, of what country they were originally natives.

The period is not known at which the horse was first domesticated. He is mentioned by the old writers, and it is probable that his subjugation was nearly coeval with the earliest state of society.

The first breaking of the horse for riding is attributed by some authors to the Lapithæ, a people of Thessaly, and is thus described by Virgil in his third *Georgic*:—

“Bold Erichonius was the first who join’d
Four horses for the rapid race design’d,
And o’er the dusty wheels presiding sat;
The Lapithæ to chariots add the state
Of bits and bridles; taught the steed to bound,
To run the ring, and trace the mazy round;
To stop, to fly, the rules of war to know,
T’ obey the rider, and to dare the foe.”

There is a great diversity of opinion among authors as to the period when men first began to mount horses, for the purpose of riding. From the writings of Homer, we must conclude that horses were ridden long before his time, for, in a metaphor, in the fifteenth book of the *Iliad*, he compares the strength of Ajax, bounding from ship to ship, to that of a horseman on a strong steed.

“Nor fights, like others, fixed to certain stands,
But looks a moving tower above the bands;
High on the decks, with vast gigantic stride,
The godlike hero stalks from side to side.
Lo, when a horseman, from the watery mead
(Skilled in the manage of the bounding steed),
Drives four fair coursers, practised to obey,
To some great city through the public way,
Safe in his art, as side by side they run,
He shifts his seat, and vaults from one to one;
And now to this, and now to that he flies;
Admiring numbers follow with their eyes.”

It is quite evident that horses were not used for riding till long after the period that they were harnessed in war chariots. Sir Gore Ouseley mentions, in his *Travels through Persia and various Countries of the East*, that he examined all the relics of antiquity to be found among the ruins of Persepolis, from which he drew a conclusion, which is at once interesting, and in some

sure confirmatory of the opinion above noticed, that the horse had been gradually subdued. He says, "There are no figures mounted on horseback, although some travellers have mentioned horsemen among these sculptures. One would think that the simple act of mounting on a horse's back would naturally have preceded the use of wheel-carriages and their complicated harness; yet no horsemen are found at Persepolis; and we know Homer's horses are represented in chariots, from which the warriors sometimes descended to combat on foot, but the poet has not described them as fighting on horseback. The absence of mounted figures might authorise an opinion that these sculptures had been executed before the time of Cyrus, whose precepts and example first inspired the Persians with a love of equestrian exercises, of which, before his time they were wholly ignorant."

The varieties of the *domestic horse* vary exceedingly in different countries. *The Persian horses* have always been famous for beauty, vigour, fire, and other eminent qualities, and so celebrated that their very name, in the language of the country, signifies what may be rendered by the word, "wind foot," a term emphatically expressive of their swiftness. The ancient Persians were so fond of their horses, and thought the act of managing them so becoming and necessary a duty, that they taught their children to ride at the age of five years, as Herodotus relates. *The Parthians* were very eminent for the skill with which they managed their horses, and their manner of fighting upon them. They are described as having such dexterity and suppleness of body, and such a command over their horses, that they could turn themselves round upon their backs with such readiness, as to be able to draw their bows with the surest aim, and wound their enemies even whilst they were flying from them; this manner of fighting being peculiar to them. *The Arabian horses* are reckoned by far the best; and the solicitude with which the Arabs preserve their horses pure and unmixed, is remarkable. The care with which they are nurtured, and the skill displayed in their equestrian management, are no less admirable. None but stallions of the finest form and purest blood are allowed access to their mares,

which is never permitted but in the presence of a professional witness or public officer, who attests the fact, records the name, and signs the pedigree of each. *The Barbary horses* are descended from the Arabians, and much esteemed. Jackson mentions one very fleet variety, used for hunting the ostrich, and fed entirely on camel's milk.

The British varieties of saddle horses may be reduced to the racer, the hunter, the improved hack, the old English road horse, the galloway, and the pony. *The race horse* is descended nearly in a direct line from the Arabian, the Persian, and the Barb. In an agricultural point of view, this celebrated breed might at first sight appear of little importance; but it is probable, that to the amusement afforded by it to the rich and powerful, we are indebted for the principal improvements in every other variety of this most valuable animal. The accounts on record, of feats performed by some of our horses on the turf, are truly astonishing. Bay Malton ran at York four miles in seven minutes and forty-three seconds. Childers, known by the name of the Flying Childers, moved through a space equal to 82 feet and a half in a second. After these, Eclipse, and others, have contributed to keep up the reputation of the English racer. *The hunter* is a happy combination of the speed of the Arabian, with the durability of the native horse; more extended in form, but framed on the same principles, he is able to carry a considerable weight through heavy grounds, with a swiftness and perseverance astonishing to the natives of every other country. *The improved hackney* is derived, like the former, from a judicious mixture of the blood-breed with the native horse, but exhibiting a greater proportion of the latter. In the hackney, we look particularly to the fore parts, to see that they are high and well placed; that the head is not heavy, nor the neck disproportionately long or short; that the legs stand straight and that the elbows turn out; and although a perfect conformation in the hinder parts is necessary to the hackney, it is in some measure subordinate to the same perfection in the fore parts; whereas, in the racer and hunter, but particularly in the former, the form of the hinder is even of more consequence than that of the

fore parts. *The old English road horse* is now nearly extinct; it is probable that it originally sprang from a judicious culture from horses of Norman, German, or Flemish extraction. Neither is it at all impossible, that in the more fertile parts of the island, an original breed existed of considerable power and bulk. The "scythed chariots drawn by fiery steeds" of the ancient Britons struck terror even into Caesar's legions. The old English road horse possessed great power, with short joints, a moderate shoulder, elevated crest, with legs and feet almost invariably good. *The Irish road horse or hunter* is an excellent breed. With similar properties to the old English road horse and but of an improved form, with great acquired aptitude for leaping, it gained the name of the Irish hunter. As roadsters, these horses have ever proved valuable, uniting durability, ease, and safety, with extreme docility. In form they may be considered as affording a happy mixture of an improved hack with our old English roadster.

The Welch horse bears a near resemblance, in point of size and hardiness, to the best of the native breed of the highlands of Scotland, and other hilly countries in the north of Europe. It is too small for the present two-horse ploughs, but few horses are equal to them for enduring fatigue on the road. "I well remember one," says Mr. Culley, "that I rode for many years, which, to the last, would have gone upon a pavement by choice, in preference to a softer road." A little horse, of much the same size with the former, or rather larger, called a *galloway*, from its being found chiefly in that province of Scotland, is now become very rare, the breed having been neglected from its unfitness for the present labours of agriculture. The true galloways are said to resemble the Spanish horses; and there is a tradition, that some of the latter, who escaped from one of the vessels of the Armada wrecked on the coast of Galloway, were allowed to intermix with the native race. Such of this breed as have been preserved in any degree of purity, are of a light bay or brown colour, with black legs, and are easily distinguished by the smallness of their head, and the cleanness of their bone.

Dr. Anderson gives the following de-

scription of this variety:—"There was once a breed of small elegant horses in Scotland, similar to those of Ireland and Sweden, and which were known by the name of galloways, the best of which sometimes reached the height of fourteen hands and a half. One of this description I possessed, it having been bought for my use when a boy. In point of elegance of shape, it was a perfect picture, and in disposition was gentle and compliant. It moved almost with a wish, and never tired. I rode this little creature for twenty-five years, and, twice in that time, I rode one hundred and fifty miles at a stretch, without stopping except to bait, and that not for above an hour at a time. It came in at the last stage with as much ease and alacrity as it travelled the first. I could have undertaken to have performed, on this beast, when it was in its prime, sixty miles a day for a twelvemonth running, without any extraordinary exertion."

In 1814, a galloway performed a feat of greater magnitude than anything mentioned by Dr. Anderson. He started from London along with the Exeter mail, and notwithstanding the numerous changes of horses, and the very rapid driving of the mail, he reached Exeter a quarter of an hour before it—thus performing the astonishing distance of one hundred and seventy-two miles, at an average of about nine miles an hour. *The experiment was of the most brutal kind*, and was fatal to the farther energy of this fine animal, which, with good treatment, might have been long an invaluable servant. Twelve months after this astonishing feat, he was seen spavined, wind-galled, and ring-boned, exhibiting a picture of the utmost wretchedness, brought on by the barbarous inhumanity of man.

The still smaller horses of the Highlands and Isles of Scotland, are distinguished from larger breeds by the several appellations of *Highland ponies*, *Sheltons*, and in Gaelic of *Garrons* or *Gearrons*. They are reared in great numbers in the Hebrides or Western Isles, where they are found in the greatest purity. The highland horse is sometimes only nine, and seldom twelve hands high, excepting in some of the southern of the Hebrides, where the size has been raised to thirteen or four-

teen hands, by selection and better feeding. The common colours are bay, gray, and black; the last is the favourite colour. The ponies of the highlands of Scotland, although very hardy, from being seldom kept in a stable, even in the winter season, are cross-made animals of a small size, and much inferior, in point of appearance and action, to the galloway, so long the boast of Scotland. They have large heads and long backs; their legs short, standing considerably lower before than behind, which gives them a most unpleasant action and rough trot. The only way in which they can be comfortably ridden is at an amble. They can go considerably faster up a gentle acclivity than on level ground, and are very serviceable in the higher mountainous countries, being sure-footed, and extremely cautious what road they pursue. The Rev. Mr. Hall, in his *Travels through Scotland*, gives the following illustration of this fact. "When these animals come to any boggy piece of ground, they first put their nose to it, and then pat on it in a peculiar way with one of their fore-feet; and from the sound and feeling of the ground, they know whether it will bear them. They do the same with ice, and determine in a minute whether they will proceed."

The varieties of draught horses were originally as numerous as the districts in which they were bred, each having its favourite breed; but since the intercourse among farmers and breeders has been greater, those in common use are so mixed as to render it difficult to determine of what variety they partake the most. At present the principally esteemed draught horses are the Suffolk punch, the Cleveland bay, the black, and the Lanark or Clydesdale. The native breeds of draught horses are much too small for the purpose of agricultural draught, as now conducted; but by cultivation, the improved breeds pointed out, have furnished such animals as are required of them. *In a horse for the plough*, strength and agility are required. It is not size that confers strength, the largest horses being soonest worn out; a dash of blood therefore is not disadvantageous. A quick step, an easy movement, and a good temper, are qualities of the greatest importance to a working horse, and

the possession of them is of more importance than big bones, long legs, and a lumpy carcass. To feed well also is a property of great value. If straight in the back, and not over short, high in the ribs, and with hocks close and round, the animal, is generally hardy, and capable of undergoing a great deal of fatigue, without lessening his appetite or impairing his working powers. *The form of a horse peculiarly adapted to the labours of agriculture*, has been thus described:—"His head should be as small as the proportion of the animal will admit; his nostrils expanded, and muzzle fine; his eyes cheerful and prominent; his ears small, upright, and placed near together; his neck rising out from between his shoulders, with an easy tapering curve; must join gracefully to the head; his shoulders being well thrown back, must also go into his neck (at what is called the points) unperceived, which perhaps facilitates the going much more than the narrow shoulder; the arm or fore-thigh should be muscular, and, tapering from the shoulder, meet with a fine, straight, sinewy, bony leg; the hoof circular, and wide at the heel; his chest deep, and full at the girth; his loin or fillets broad and straight, and body round; his hips or hocks by no means wide, but quarters long, and tail set on so as to be nearly in the same right line as his back; his thighs strong and muscular; his legs clean and fine-boned; his leg-bones not round, but what is called lathy or flat." *The black cart horse*, bred in the midland counties of England, is better suited for drays and waggons than for the common operations of a farm. The present system of farming requires horses of more mettle and activity, better adapted for travelling, and more capable of enduring fatigue. This variety is understood to have been formed, or at least brought to its present state, by means of stallions and mares imported from the low countries, though there appears to be some difference in the accounts that have been preserved, in regard to the places from whence they were brought, and the persons who introduced them. The present improved sub-variety of this breed, took its rise from six Zealand mares, sent over from The Hague by Lord Chesterfield, during his embassy at

that court, furnishing those grand teams we see in the coal, flour, and other heavy carts and waggons about London, where the immense weight of the animal's body assists his accompanying strength to move the heaviest loads. *The Cleveland bays*, which owe some of their most valuable properties to crossings with the race-horse, have been long celebrated as one of the best breeds in the island, but they have somewhat degenerated of late. A great many of these horses are bred in Yorkshire; the farmers of which county are remarkable for their knowledge of every thing that relates to this species of live stock. For activity and hardiness this breed is very remarkable. Some capital hunters have been produced by putting full-bred stallions to mares of this sort, but the chief object latterly has been to breed coach-horses, and such as have sufficient strength for a two-horse plough. Three of these horses draw a ton and an half of coals, travelling sixty miles in twenty-four hours, without any other rest than two or three baits upon the road, and they frequently perform this labour four times a week. *The Suffolk punch* is a very useful animal for rural labour. Their merit seems to consist more in constitutional hardiness than true shape. Their colour is mostly yellowish, or sorrel, with a white ratch, or blaze on their faces, the head large, ears wide, muzzle coarse, fore-end low, back long, but very straight, sides flat, shoulders too far forward, hind-quarters middling, but rather high about the hips, legs round and short in the pasterns, deep bellied and full in the flank; here, perhaps, lies much of the merit of these horses; for we know, from observation and experience, that all deep-bellied horses carry their food long, and consequently are enabled to stand longer and harder days' works. However, it is certain that these horses do perform a surprising deal of work in a day. It is well known that the Suffolk and Norfolk farmers plough more land in a day than any other people in the island, and these are the kind of horses every where used in those districts. *The Clydesdale* horse has long been in high repute in Scotland, and the north of England, and for the purposes of the farmer is probably equal to any other breed in Britain. Of the origin of this

race various accounts have been given, but none of them so clear, or so well authenticated as to merit any notice. They have this name, not because they are bred only in Clydesdale, or Lanarkshire, for the same description of horses is reared in the other western counties of Scotland, and over all that tract which lies between the Clyde and the Forth; but, because the principal markets at which they are sold, Lanark, Carnavath, Rutherglen, and Glasgow, are situated in that district, where they are also preserved in a state of greater purity than in most other parts. They are rather larger than the Suffolk punches, and the neck is somewhat longer, their colour is black, brown, or gray, and a white spot on the face is esteemed a mark of beauty. The breast is broad, shoulders thick, the blades nearly as high as the chine, and not so much thrown backwards as in road-horses, the hoof round, usually of a black colour, and the heels wide, the back straight and broad, but not too long; the hocks visible, but not prominent, and the space between them and the ribs short, the tail heavy and well haired, the thighs meeting each other so near as to leave only a small groove for the tail to rest on. One most valuable property of this breed is that they are remarkably good horses to draw, and very rarely turn restive.

ON THE BREEDING AND REARING OF HORSES.

Unfortunately, much less attention has been paid to breeding horses than to breeding cattle or sheep, although a pound of horse-flesh is worth two of that of any other stock, and it costs just as much to breed a bad horse as a good one. Some judgment is generally exercised with regard to the stallion, but breeders frequently employ ill-formed worthless mares merely because they are unfit for any other purpose than bringing a foal; this, however, is reprobated by the best writers upon agriculture. In districts where the breeding of horses is carried on upon a large scale and a regular plan, the breeding of stallions forms a separate branch, and is confined, as in the case of bulls and rams, to a few eminent breeders. *In choosing the parents*, or stallion and mare, regard must be had to the kind of stock desired to be bred. Whatever may be

the particular purpose of the breed, a stallion ought first to possess all the general properties of a good horse and next the characteristic criteria of the desired stock. The produce, whether male or female, much more frequently acquires and retains the form, make, marks, and disposition of the size than the dam. On this account, stallions with the least appearance of disease, blemish, or bodily defect of any kind, where there is the slightest probability of its being transmitted to the offspring, should be rejected as improper. Provided the parents are free from hereditary infirmities, disorders which arise from accident are of no consequence. The general properties required in a breeding mare are a good shape, a gentle disposition, a large carcass, conformably to her height, and belly well let down: she must be perfectly free from all sorts of blemishes and defects. *The mare which is intended to supply draught colts* should be large limbed, close jointed, short docked, wide chested, home ribbed, with a capacious body; her eyes good, and her nostrils large and open; in disposition she ought to be gentle and tractable, of a constitution healthy, and vigorous, free from any blemishes either hereditary or acquired. The horse should be bold and spirited, well made, and of a kind disposition; his constitution should be strong, his temper good, and in short ought not to be contaminated with diseases or vice of any kind. *The age at which horses should be allowed to breed* is not determined by practice, but is made to depend upon the state of maturity to which the animals are advanced. It seems, however, reasonable that they should have obtained their full strength. The stallion should be four years old and the mare five. *Three months before a stallion is put to mares*, he should be well fed with good oats, pease or beans, and a little hay, a good quantity of wheat-straw, regularly watered, and have long continued walking exercise, every day, but not overheated. *The usual season for the generative process* is from the beginning of April to July, but the month of June is considered the best season in this country. A mare goes eleven months and a few days with foal, and the great object is for her to foal in warm weather, and when there is plenty of grass. An early colt is always to be preferred to one that

falls late in the season. At the season of parturition there should be a suitable supply of food for the mother and young. *In breeding horses on a large scale*, it is easy to contrive, so that all the foals may be brought forth at a time when there is plenty of grass. About the end of May put all the mares into an enclosure, capable of feeding them, as long as the stallion is to be with them or that they are in season. In this enclosure, all the mares those which are barren as well as others are to be put. The stallion's hind shoes are to be taken off, but the fore shoes should be left on or tips to preserve his feet. At first it may be proper to have a bridle on him, but having been put to one or two mares he may then be turned loose. A little lodge should be built up in some part of the enclosure, and pease, beans, oats, bread, &c., put into the manger that the horse may retire from the heat, and eat what he likes best. *Breeding mares are usually worked through the greater part of the year*, until a week or two before foaling, and during the summer season when giving suck to the young foal. This working appears to be an improper and unprofitable practice. *In the mountains of Wales, and in the Highlands of Scotland*, the breeding mares are never worked during the summer. They are driven to the hills and mountains at the close of the barley-seed season, where they remain until the inclemency of the season forces them to return for shelter, but the scanty subsistence they find, and the dampness and coldness of the climate greatly deteriorate the value of the mares and their offspring. The greater number of horses are bred in situations where a small portion of arable land is attached to farms, chiefly occupied with cattle or sheep, or where the farms are so small as not to afford full and constant employment to the number of horses that must be kept on the farms. *Breeding mares* are, however, evidently unable to endure the fatigue of constant labour for some months before and after parturition. During the first winter, foals are fed on hay with a little corn, but should not be constantly confined to the stable, for even where there is nothing in the fields to feed them, exercise out of doors is favourable to their health. *Rearing includes the treatment of the foal till it is fit to work*, or to be put in

training for use, and also the treatment of the mother till she has weaned her foal. *In regard to the treatment of the mare till she has weaned her foal.*—In England and the improved parts of Scotland, a mare having foaled, is turned, together with the foal, into a pasture field, and is allowed two or three weeks before she is again worked, either in plough or cart, the foal being allowed to suck at pleasure during the time. After a few weeks rest, she is worked again in the usual manner, the foal being commonly shut up during the hours the mare is worked. In Yorkshire, Scotland, and other English counties, after the colt is a few weeks old, and has required strength and agility enough to follow its mother, it is allowed to attend her in the field during the hours of labour, and to suck occasionally. The colt thus has sufficient exercise, the mother's milk does not become heated; the young animal becomes hardy, loses all timidity, and afterwards is more easily broken. The foals usually suck from the time of their birth until Michaelmas or about six months, when they are weaned or cease from sucking. *The training of cart and plough horses* commences with taming before they are a year old, with walking and rubbing them down in the stable when they are two, and with training them to work when they are of three years' growth; they should be placed under the charge of a very steady careful servant, who will teach them to back and go into the shafts. They ought not, however, to be made to draw any other than a very light empty cart till their fourth or fifth year, nor ought they to be put into the shafts of a threshing machine before their fifth year. The first work to which an agricultural horse may be applied is harrowing; but this, during the fourth year, only half a day at a time, or with a light harrow the whole day. Next he may be put to plough with similar care and caution in regard to strength.

The first breaking of the horse should only be intrusted to persons of mild dispositions, as it is by kind and patient treatment alone that we can hope to succeed in rendering this valuable animal truly useful and docile; for although force may produce obedience, it will be found, as with man himself, that so soon as fear is removed, and the

animal has discovered its own strength, revenge will generally follow. I have no doubt but in nine cases out of ten, where horses betray furious or stubborn tempers, that these have been produced from the cruelty or ignorance of their first trainers. The horse is an animal of great intelligence; but every thing addressed to his perceptions should be clear, short, and distinct, for he is incapable of following a train of spoken language. Few words delivered with precision, accompanied by caresses and gentle treatment, will be found more effectual than any other course.

With regard to the management of horses in harness in Germany, perhaps the most striking feature to English eyes is, that the Germans intrust these sensible animals with the free use of their eyes. "As soon as, getting tired, or, as we are often apt to term it, 'lazy,' they see the postilion threaten them with his whip, they know perfectly well the limits of his patience, and that after eight, ten, or twelve threats, there will come a blow. As they travel along, one eye is always shrewdly watching the driver: the moment he begins his slow operation of lighting his pipe, they immediately slacken their pace, knowing as well as Archimedes could have proved, that he cannot strike fire and them at the same time; every movement in the carriage they remark; and to any accurate observer who meets a German vehicle, it must often be perfectly evident that the poor horses know and feel, even better than himself, that they are drawing a coachman, three bulky baronesses, their man and their maid, and that to do this on a hot summer's day is no joke." Now, what is our method? "In order to break in the animal to draught, we put a collar round his neck, a crupper under his tail, a pad on his back, a strap round his belly, with traces at his sides, and, lest he should see that, though these things tickle and pinch, they have not power to do more, the poor intelligent creature is blinded with blinkers, and in this fearful state of ignorance, with a groom or two at his head, and another at his side, he is, without his knowledge, fixed to the pole and splinter-bar of a carriage. If he kicks, even at a fly, he suddenly receives a heavy punishment which he does not comprehend; something has struck him and has hurt him severely; but as fear mag-

nifies all danger, so, for aught we know or care, he may fancy that the splinter-bar which has cut him is some hostile animal, and expect, when the pole bumps against his legs, to be again assailed in that direction. Admitting that in time he gets accustomed to these phenomena—becoming, what we term, steady in harness—still, to the last hour of his existence, he does not clearly understand what it is that is hampering him, or what is that rattling noise, which is always at his heels:—the sudden sting of the whip is a pain with which he gets but too well acquainted, yet the ‘unde derivatur’ of the sensation he cannot explain—he neither knows when it is coming, nor what it comes from. If any trifling accident, or even irregularity occurs—if any little harmless strap which ought to rest upon his back happens to fall to his side—the unfortunate animal, deprived of his eyesight, the natural lanterns of the mind, is instantly alarmed; and though from constant heavy draught he may literally, without metaphor, be on his last legs, yet if his blinkers should happen to fall off, the sight of his own dozing master, of his own pretty mistress, and of his own fine yellow chariot in motion, would scare him so dreadfully, that off he probably would start, and the more they all pursued him the faster would, he fly! I am aware that many of my readers, especially those of the fairer sex, will feel disposed to exclaim, Why admire German horses? Can there be any in creation better fed or warmer clothed than our own? In black and silver harness, are they not ornamented nearly as highly as ourselves? Is there any amusement in town which they do not attend? Do we not take them to the Italian Opera, to balls, plays, to hear Paganini, &c., and dont they often go to two or three routs of a night? Are our horses ever seen standing before vulgar shops? And do they not go to church every Sunday, as regularly as ourselves? Most humbly do I admit the force of these observations; all I persist in asserting is, that horses are foolishly fond of their eyesight; like to wear their heads as nature has placed them; and have bad taste enough to prefer dull German grooms and coachmen, to our sharp English ones.”

CRITERIA OF THE QUALITIES OF THE HORSE FOR VARIOUS PURPOSES.

The general criteria of the qualities of a horse are derived from inspection and trial. His outward appearance among judges affords a pretty just criterion of his powers, and a moderate trial usually enables the same judgment to decide on the disposition to exercise such powers. *The criteria of a horse derived from his colour.*—As a general principle dark are preferable to light horses, except in the instances of the black, which has fewer good horses within its range than any other, particularly in the lighter breeds. Grey horses are valuable, and bay and brown are always esteemed colours. *The criteria of action* are derived from a due consideration of the form generally, and of the limbs particularly, as well as from seeing the horses perform his paces in hand. *The criteria of hardihood* are derived from the form of the carcass which should be circular or barrelled. *The criteria of spirit, rigour, or mettle*, as it is termed, are best derived from trial. A hot fiery horse is objectionable. A good couraged horse moves with readiness, whether alone or in company: he carries one ear forward, and one backward, is attentive and cheerful, loves to be talked to, and caressed even while on his journey, and if in double harness will play with his mate. Good couraged horses are always the best tempered, and under difficulties are by far the most quiet, and the least disposed to do mischief. *The criteria of a waggon horse* are, that he should be weighty and large. Rapidity of motion is greatly subordinate to strength. It is all collar-work, and if the pull ceases the load stands still. The waggon-horse should be patient in the extreme; willing to lie to his collar up hill, and yet settle into his share of work on level ground. As his exertions are constant, it is of the greatest consequence that he be a good feeder. *The chief points in a farming cart-horse*, are neck not too long, nor too thick; short legs, rather flat than round and gummy; fore feet even, not too distant; wide chest, strong but not high shoulders; considerable length of waist supported by a wide loin; quarters full, and rather raised; strong muscular thigh, size, fifteen hands

one inch to sixteen hands high. *The horse used in husbandry* ought to be able to walk four or five miles an hour. In that case he would plough more land in a given time, and work in the cart or waggon with more dispatch when wanted. In harvest time a nimble and strong horse is valuable. In drawing manure into the field or corn to the market, the farmer also will find his account in strength and activity, for as the draught in all these cases is light one way, such horses would do their business with speed. The small farmer with this kind of horse need not keep an idle one; he might carry his master to market and plough the remainder of the week. *A horse should never be ridden hard down a hill*, as this has a tendency to shake and weaken his forelegs; and he ought to get but little water on a journey, and he should not be allowed to drink until perfectly cool; nor should he be fed with oats for a quarter of an hour at soonest, after having had exercise. The first thing that should be attended to is to rub the horse carefully down, and not to leave him while a wet hair remains on his body.

The criteria of horses' age.—One of the most important things to be known is derived from the appearance of the teeth. The horse has forty; twenty-four grinders, four eye teeth, and twelve incisive teeth. Mares have no eye teeth, or if they have them they are very short; the grinders are not instrumental to the knowledge of their age, we form our judgment from the front and eye teeth. According to La Fosse the younger, there are these appearances. The horse is foaled with six molar or grinding teeth in each jaw; the tenth or twelfth day after, the two front nippers appear above and below, and in fourteen or fifteen days from this, the two intermediate are pushed out; the corner ones are not cut till three months after. At ten months the incisive or nippers are level with each other, the front less than the middle, and these again less than the corners; they at this time have a very sensible cavity. At twelve months this cavity becomes smaller, and the animal appears with four molar teeth on each side, above and below, three of the temporaneous or colt's, and one permanent or horse tooth; at eighteen, the cavity in the

nipper is filled up, and there are five grinders, two of the horse, and three temporaneous; at two years the first of the colt's molar teeth in each jaw, above and below are displayed; at two years and a half or three years the front nippers fall and give place to the permanent ones; at three and a half the middle nippers are likewise removed, at which period the second milk molar falls; at four years the horse is found with six molar teeth, five of his new set and one of his last; at four years and a half the corner nippers of the colt fall and give place to the permanent set, and the last temporaneous grinder disappears; at five years old the tushes in the horse usually appear; at five and a half they are completely out, and the internal wall of the upper nippers, which before was incompletely formed, is now on a level with the rest; at this period the incisive or nippers have all of them a cavity formed in the substance between the inner and outer walls, and it is the disappearance of this that marks the age; at six years those in the front nippers are filled up, the tushes are also slightly blunted; at seven years the mark or cavity in the middle nippers is filled up, and the tushes a little more worn; at eight years old the corner nippers are likewise plain, and the tushes are round and shortened. In mares, the incisive or nippers alone present a criterion; at this period, the horse is said to be aged, and to have lost his mark; but, among good judges, the teeth still exhibit sufficient indication. At nine, the groove in the tushes is worn away nearly, and the nippers become rather roundish; at ten, these appearances are still stronger; at twelve, the tushes only exhibit a rounded stump, the nippers push forward, become yellow, and as the age advance, appear triangular, and usually uneven.

To make a colt appear older than he really is, both breeders and dealers very commonly draw the nippers. *To make a horse appear younger than he really is*, dealers perform an operation on the teeth called bishopping, which consists in making an artificial cavity, in the nippers after the natural cavity has been worn out by age, by means of a hard sharp tool, which cavity is then burned black by a heated instrument. But no art can restore the tushes to

their form and height, as well as their internal grooves. It is, therefore, common to see the best judges thrust their finger into a horse's mouth, contenting themselves with merely feeling the tush. *The duration of the life of horses* is like that of every other species of animals, in proportion to the time of their growth. Man, who is above fourteen years in growing, lives six or seven times as long, that is to say, eighty or one hundred years. The horse, who attains his full growth in four years, lives six or seven times as long, that is to say, twenty-five to thirty years. There are so few examples to contradict this rule, that we should not even regard them as exceptions from which we may draw any precedents, and as robust horses are at their entire growth in less time than delicate ones, they also live less time, and at fifteen years of age they are old. *The horse sleeps* much less than man; for, when he is in health, he does not rest above two or three hours together; he then gets up to eat, and, when he is too much fatigued, he lies down a second time, after having eaten, but, on the whole, he does not sleep more than three or four hours out of the twenty-four. There are even some horses who never lie down, but sleep standing. It has been also remarked, that geldings sleep oftener and longer than horses. *When the horse is* impassioned with love, desire, or appetite, he shows his teeth, and seems to laugh; he shows them also when he is angry and would bite; he sometimes puts out his tongue to lick, but less frequently than the ox, who licks much more than the horse, and who, notwithstanding, is less sensible to caresses.

To have an idea of this noble animal in his native simplicity, we are not to look for him in the pastures, or the stables, to which he has been consigned by man, but in those wild and extensive plains where he has been originally produced, where he ranges without control, and riots in all the variety of luxurious nature. In this state of happy independence, he disdains the assistance of man, which only tends to his servitude.

Plutarch says, "a good man will take care of his horses and dogs, not only while they are useful to him, but also after age renders them unfit for service."

A beautiful illustration of this benevolent maxim is recorded of the Athenians, who, when they had finished building the *Hecatompodon*, set at liberty the animals employed in its erection. It is related that one of these, at the head of his fellow-labourers, some time after the completion of the temple, led the way to the citadel, which so highly pleased the people, that a decree was made by the senate, enacting that these faithful and willing servants should be kept the remainder of their lives at the public expense.

Every humane mind must shudder at the brutal treatment to which that noble and generous animal, the horse, is but too frequently exposed in Europe. The ass, also, a beast of great sagacity and gentleness, is almost invariably treated with savage barbarity. Let those unfeeling and unprincipled wretches look to the mutual love that subsists between the Arab and his steed, and the kindness manifested by the people of eastern nations to their asses and mules, and the benefits they derive from such a mode of treatment. If no other principle will awaken their kindly feelings, surely that of self-interest should stimulate them to adopt gentler measures.

As the Arabians have only a tent for their house, this tent serves them also for a stable. The mare, colt, husband, wife, and children, lie promiscuously together; and the little children will lie on the body and neck of the mare and colt, without these animals incommoding or doing them the least injury. These mares are so accustomed to live in this familiarity, that they will suffer any kind of play. The Arabians treat them kindly, talk and reason with them, and take great care of them, and never use the spur without necessity; whence, as soon as they feel their flank tickled with the stirrup-iron, they set out immediately with incredible swiftness, and leap hedges and ditches with as much agility as so many does; and if their rider happens to fall, they are so well broken, that they will stop short even in the most rapid gallop.

An affecting instance is on record of the attachment which the Arabians feel for their horses. A poor Arabian of the desert was possessed only of a mare, which the French consul, at Saïd, was desirous to purchase, that he might send her as a present to Louis XIV. The

Arab hesitated long, but want drove him to consent, on condition of receiving a large sum, which he himself named. The Arab, clothed in his rags, brought his courser to the consul, dismounted, looked first at the tempting gold, and then stedfastly at his mare: but here his heart failed him. He heaved a deep sigh, and fondly exclaimed, "to whom am I going to give thee up? To Europeans!! who will tie thee close, who will beat thee, who will render thee miserable! Return with me, my beauty! my jewel! and rejoice the hearts of my children." Then, springing on the back of the animal, he was out of sight in a moment.

White, in his *Natural History of Selborne*, proves the *sociable disposition* of the horse, by the following anecdote:—"There is a wonderful spirit of sociality in the brute creation, independent of sexual attachment: the congregating of gregarious birds in the winter is a remarkable instance. Many horses, though quiet with company, will not stay one minute in a field by themselves; the strongest fences cannot restrain them. My neighbour's horse will not only not stay by himself abroad, but he will not bear to be left alone in a strange stable without discovering the utmost impatience, and endeavouring to break the rack and manger with his fore-feet. He has been known to leap out of a stable-window through which dung was thrown after company, and yet, in other respects, is remarkably quiet."

The horse also remembers *ill treatment* much longer, and is sooner rebuffed than the ox: his natural spirit and courage are such, that, when he finds more is expected from him than he is able to perform, he grows angry, and will not endeavour; instead of which, the ox, who is slow and idle, exerts himself, and is more easily tired. That horses are capable of feeling resentment, is proved by a curious circumstance. "A baronet, who was in possession of a hunter which seemed to be untireable, resolved to try if he could not completely fatigue him. After a long chase, he dined, mounted him again, and rode him furiously among the hills, till the animal was so exhausted that he reached the stable with the utmost difficulty.—More humane than his worthless master, the groom shed tears to see the state of the horse. Shortly afterwards,

on the baronet entering the stable, the horse furiously sprung at him, and he would have perished had he not been rescued by the groom."

Pliny tells us, that if a horse in drinking plunged his nose deep into the water, it was reckoned a *sign of spirit* and courage, and this notion prevails, even at present, in this country. Quadrupeds do not all drink in the same manner, though they are all equally obliged to seek with the head for the liquor which they cannot get any other way, excepting the monkey, and some others that have hands, and consequently drink like men, when a vase or glass is given them which they can hold; for they carry it to their mouths, inclining the head, throwing down the liquor, and swallowing it by the simple motion of deglutition. Man usually drinks in the same manner, because it is the most convenient. Quadrupeds, in general, also choose that mode which is most agreeable to them, and constantly follow it. The dog, whose mouth is very large, and the tongue long and thin, drinks lapping; that is, by licking the liquor, and forming with the tongue a kind of cup or scoop, which fills each time with a tolerable quantity of liquor, and this mode he prefers to that of wetting the nose. The horse, on the contrary, whose mouth is small, and whose tongue is too short and thick to scoop it up, and who always drinks with more avidity than he eats, dips the mouth and nose quickly and deeply into the water, which he swallows largely by the simple mode of deglutition, but this forces him to drink without fetching his breath, whilst the dog breathes at his ease while he is drinking. Horses, therefore, should be suffered to take several draughts, especially after running, when respiration is short and quick. They should not be suffered to drink the water too cold, because that, independently of the cholic which cold water frequently occasions, it sometimes happens, that by dipping their noses into the water they take cold, which often lays the foundation of a disorder called the glanders, the most formidable of all diseases to the horse. The seat of the glanders is in the pituitary membrane, and that it is consequently a real cold which causes an inflammation in this membrane, and travellers who give us a detail of the mala-

dies of horses in warm climates, as in Arabia, Persia, and Barbary, do not say that the glanders are so frequent there as in cold climates. It is from this the conjecture arises, that this malady is occasioned by the coldness of the water, because these animals are obliged to dip and keep the nose and nostrils a considerable time under water, which would be prevented by never giving it to them cold, and by always wiping the nostrils after they have drank. Asses, who fear the cold more than horses, and who strongly resemble them in the interior structure, are, notwithstanding, not so subject to the glanders, which may possibly happen from their drinking in a different manner from horses; for instead of dipping the mouth and nose deeply into the water, they scarcely touch it with their lips.

GENERAL REMARKS ON THE HEALTHY AND DISEASED STATE OF THE HORSE.

Condition of horses.—Being in condition in stable language, signifies not only perfect health internally, but such an appearance externally as the philosopher would call unnatural, or at least artificial, while the amateur considers it as an essential requisite to the other qualities of the horse. This external condition is denoted by a sleek, short, shining coat, with a degree of flesh neither bordering on fatness nor emaciation. *To bring a horse into condition.*—Not only should the purposes he is intended for be taken into account, but also his previous state. If a lean horse is to be brought into condition, and if from grass, mash him for a day or two, and by no means stint him in his water, and his meat; let his corn also be soaked. If corn be speared or malted, it will produce flesh sooner. As his appearance improves, gradually harden his food and increase his exercise. It is common to hear persons say, "My horse is sadly out of condition; and I cannot tell either what is the matter with him, or how to get him into better case." Various are the causes that may produce this: a sudden alteration of the food or temperature, or of habits altogether, may become a cause. Removing a horse from grass to a heated stable, full feeding and hard exercise, will often do it: therefore these changes should always be gra-

dual. Bad food, as mow-burnt hay, musty oats, beans, &c. likewise mineral waters, foul air, &c. are frequent causes. Diabetes or profuse staling, is often brought on by these means, and the condition of the horse becomes greatly reduced. It is requisite, therefore, to inquire whether any of these errors are in existence, and immediately to remove them: but it often happens that the stomach has become relaxed and the hide becomes bound; neither of which readily remove, even though the original evil may be amended. When the relaxed stomach has produced lam-pas, treat the mouth as described under that disease; but the stomach itself must be principally attended to. First mash, and give a dose of physic, after it has set, commence the treatment, if the horse be of a full habit, by a moderate bleeding, and a nightly *alterative*. But if he not in full, but in low flesh, commence by a daily *tonic*, which will gradually remove the swelling within the mouth and loosen the hide. Sudden cold applied to the skin often brings on a want of condition with *surfeit*. In such cases bleeding, nightly alteratives, with or without an assistant dose of physic, as the horse may require, constitute the proper treatment. *Worms* form another cause of morbid condition, which are to be removed as already described. *Excessive fatigue* is also productive of a bad state of condition, which often proves very obstinate. Turning out to very good grass is the quickest cure, or when that is impracticable, soiling in the stable, or feeding with carrots, parsnips, beet-root, &c. will be good restoratives; as medicines give tonics daily. It will only be necessary to add, that in considering the state of a horse's condition the effect is apt to be mistaken for the cause, and the symptoms for the disease. Being hide-bound and lampas are not in themselves any thing more than effects or symptoms: the former being commonly, and the latter being always, dependent on a deranged state of the stomach; both are therefore to be treated accordingly. Exactly the same will apply to all the other symptoms of morbid condition.

The diseases of the horse are as numerous and important, as might be expected from his complicated structure, and the artificial state of his present

mode of life. Ignorant farriers, grooms, and shoeing-smiths, were, until of late, employed in curing the diseases to which the horse is liable; but the establishment of a school for the veterinary art has disseminated a better practice, and spread improved practitioners throughout the country: we earnestly recommend an application to one of established reputation in all cases of difficulty and danger. But as such skilful practitioners are not always at hand, and yet to put the agriculturist in possession of the necessary information respecting the cure of diseases to which horses are liable, we submit a concise view of them.

In the treatment of diseases, whether of the horse, or of the nobler animal, man, it is a striking feature of integrity and penetration to choose but few medicines, and those of the best kind, and most efficacious quality. In contemplating the primary causes of almost all the diseases incident to the horse, we shall find that they chiefly derive their origin from some species of inflammation. When any of the *internal parts* are inflamed, a fever is generally produced, the violence of which will depend upon the importance of the inflamed organ, as well as upon the extent of the inflammation; some of the internal parts being more essential to life than others, and when inflamed, occasioning of course a greater derangement in the system.

Writers on farriery have described a great variety of fevers. As soon as a horse is attacked by this disease, let him be bled: and if costiveness follow, give him a pint of castor oil, or the oil of olives.

Inflammation of the lungs.—Medical writers usually make a distinction between inflammation of the lungs and of the pleura, or the membrane which covers those organs; calling the former *peripneumony*, and the latter *pleurisy*. This distinction, however, is not necessary, in veterinary nosology, since those parts are never affected separately in the horse. The first thing to be done under this dangerous malady is to *bleed copiously*. If the disease does not appear to abate in twelve hours after the bleeding, particularly if it has become more violent, the operation should be repeated, and with considerable freedom.

Inflammation of the bowels.—This disease in horses is not so frequent as the preceding, though it is equally dan-

gerous, and more rapid in its progress.

In this disease, also, *early and copious bleeding is the most important remedy.*

The horse should be covered with warm clothing, and a warm embrocation assiduously rubbed upon the whole of the abdomen; rowels opened about the chest and belly; and if the animal be costive, give a pint of castor oil, and let clysters of fine water gruel be injected into the bowels. *Inflammation of the stomach.*—This disease is not very common; but if it has been occasioned by poisonous herbs, or strong corroding medicines, give oily or mucilaginous liquids freely, such as decoction of linseed, gum arabic dissolved in water, and, at the same time, medicines that are capable of decomposing or destroying the poison. Clysters are to be injected, and if the disease is accompanied with purging, they should be composed of strong linseed decoction, or water gruel.

Inflammation of the kidney and bladder.—This disease is not of frequent occurrence, and is generally occasioned by an immoderate use of strong diuretic medicines. Copious draughts of linseed decoction, and clysters of the same are the proper remedies; bleeding and a dose of castor oil are necessary. A ball may also be given every sixth hour, composed of nitre half an ounce, camphor one drachm, liquorice-powder three drachms, and made up with honey sufficient for one dose. In this disease the horse can only void his urine by small drops; and if this symptom continues after these medicines have been administered, then omit the ball, and give one drachm of opium twice a day. *Inflammation of the liver.*

—*Bleeding at the commencement of the disease* is proper, but not afterwards, as it causes debility. The following ball is a good remedy. Calomel half a drachm, Barbadoes' aloes one drachm, Castile soap two drachms, and syrup enough to form the ball for one dose. *Strangles.*—This disease generally attacks young horses between the third and fifth year of their age, and consists in an inflammation and swelling of the glands under the throat, accompanied with cough, and a discharge of foul matter from the nostrils; sometimes it is attended with a soreness of the throat, and difficulty in swallowing. The remedy is that of the lancet, to produce a discharge of the offensive matter.

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Roaring.—This disease takes its name from a peculiarly displeasing sound in respiration, particularly when the horse is put into a brisk trot or gallop. Such horses should be used for the purposes of husbandry only. **Broken wind.**—The general and common cause of broken wind, is an overdistention of the stomach with hard and violent exercise at the same time. There does not seem to be any cure for this disease. **Jaundice.**—This disease is indicated by a yellowness of the eyes and mouth, dullness, and lassitude; the appetite is generally diminished, the urine of a reddish or deep colour. **Remedy.**—Calomel, half a drachm; Barbadoes' aloes, one drachm and a half; Castile soap, two drachms; rhubarb, three drachms, made up with syrup for one dose. **Flatulent cholick, Gripes, or Fret.**—This disease generally attacks suddenly, and is brought on by various causes; it is sometimes occasioned by drinking a large quantity of cold water, when the body has been heated, and the motion of the blood accelerated by violent exercise. The following draught is recommended in this disease. Balsam of copaivi, one ounce; oil of juniper, two drachms; spirit of nitrous ether, one ounce; simple mint-water, one pint; and mix the dose with mint-water. If the pain continues after giving the medicine, and inflammation is feared, then give Venice turpentine one ounce, mix with the yolk of an egg, and add gradually pepper-mint-water, one pint; spirit of nitrous ether, half an ounce, well mixed for one dose. **Apoplexy or Stagers.**—One kind of this disease inclines the horse to sleep, and another kind throws him into convulsions, and hence this disease is called the *sleepy* or the *mad stagers*. In the former case, *bleeding* is the grand remedy, and generally affords relief, and the following purgative draught should also be administered. Succotrine aloes, one ounce; Castile soap, two drachms; common salt, four ounces; water, one pint; mixed for use. In the *symptomatic* staggers, which originates from a diseased stomach, a different course must be pursued; medicines of a stimulant and anti-spasmodic quality are required, such as salt of hartshorn, asafoetida, ether, foetid spirit of ammonia, camphor, &c., or an opening medicine may be more useful. Aloes six drachms; myrrh and ginger, of each

two drachms; Castile soap, three drachms; simple mint-water, one pint; mixed for one dose. **Diarrhea or Scouring.**—This malady proceeds from an increased secretion of the fæces, arising frequently from a relaxation or irritation of the lacteal glands, in consequence of a stoppage of perspiration, fixed on the intestines. A drachm of opium every morning is a good remedy. When it proceeds from having eaten too much green food, take mutton suet, one pound; milk, one quart; boil them together till the suet is dissolved, then add starch dissolved in mucilage of linseed or gum-arabic; or take isinglass, or fish-glue, boiled into a jelly with milk, and add liquid laudanum, half an ounce. **Diabetes or excessive staling.**—This disease often proves extremely obstinate. The following remedy has been recommended. Opium, one drachm; powdered ginger, two drachms; yellow Peruvian bark, half an ounce; mixed in syrup to form the ball. If this does not succeed, and the disease is obstinate, take the following.—Salt of hartshorn, two drachms; opium, half a drachm; powdered ginger, one drachm; liquorice powder, three drachms; moulded into a ball for one dose, which generally effects a cure. **Suppression of urine.**—Horses are often attacked with a difficulty in making water, sometimes amounting to a total suppression of that excretion; this most commonly arises from spasm in the neck of the bladder, or from hardened excrement in the rectum. Whenever this happens, let large clysters of warm water be injected, in order to wash out the rectum and colon, which will enable the small intestines to perform their functions with greater facility; then give the following ball. Nitre, one ounce; camphor, two drachms; linseed-meal and syrup, to form the ball for use. If by pressing the loins of the horse, pain is produced, then are the kidneys inflamed; then the same treatment must be adopted as is recommended in that disease. **Hide-bound.**—This complaint is a tightness and roughness of skin. Worms, or an impoverished state of the blood may produce it; but bad grooming and neglect is more likely to be the cause. Warm clothing, good grooming, and regular exercise, are the remedies; the exercise should be such as to produce perspiration. For four or five days give

the following alterative ball. Barba-does' aloes, one ounce; Castile soap, nine drachms; powdered ginger, six drachms, with syrup to form the mass, and to be divided into four doses. *Mange*.—This is a species of *scabies* seldom met with; but where horses are greatly neglected in the stable. It is contagious, and horses affected with it must be kept separate, the following ointment is a proper remedy. Four ounces of sulphur vivum, finely powdered; four ounces of oil of turpentine, three ounces of hog's lard, mixed together and rubbed on the parts affected. For the lotion, four ounces of white hellebore, pulverized; boil it in three quarts of water until reduced to one; then add two drachms of muriat of quicksilver; after it has been dissolved in three drachms of muriatic acid. For the alterative ball, muriat of quicksilver, half an ounce; tartarized antimony, three ounces; powdered aniseed, six ounces; powdered ginger, two ounces, with syrup to form the mass. Divide the whole into sixteen balls and give one every morning. *Grease*.—This disease affects the heels and fetlock joints. Poultices, alterative balls, and exercise, are good remedies. This disorder generally arises from high feeding, want of exercise, and neglect of the groom. The best preventives are hand-rubbing, and washing the heels with soap and pot liquor, when the horses come in from work. The alterative ball for the grease may be made of succatrine aloes, one ounce; Castile soap, one ounce and a half; powdered ginger and myrrh, half an ounce of each, with syrup to form the mass, which must be divided into six balls. Turning horses into the salt marshes upon the sea-coast is a most excellent remedy for the grease and other eruptive disorders. *The glanders*.—This is a contagious and incurable disease. It consists of a fœtid discharge from one or both nostrils, and a swelling of the glands under the throat. In the *strangles*, the inflamed glands soon suppurate, but in the *glanders* this rarely happens. Horses thus affected must be kept in a stable by themselves to prevent others from being affected. Poultice and steam the throat and head three or four times a day; keep them well-clothed about the head. Give powdered nitre, one ounce; camphor and tartarized antimony, of each two

drachms, mixed for a daily dose. *When the disorder rages violently every prudent man will destroy a horse so infected, for the disease is as contagious as the plague*. *Farcy*.—This disease is by farriers divided into two heads, the *acute* and the *chronic*. It is a disease of the absorbents. The acute produces the glanders if the matter from a *farcy* horse be injected into the nostrils of one that is sound. *The chronical farcy* is an infectious disorder, which takes place in consequence of an obstruction and relaxation in the absorbent system. It produces a swelling in the legs, belly, and other parts of the body. The remedies are blisters and caustics, diaretics, and quick exercise to promote perspiration. Verdigris, two drachms; common turpentine, half an ounce; mixed together and made into two balls, one given at night, and the other in the morning. Clysters if costive, and a purgative ball, consisting of seven drachms of aloes, and half a drachm of calomel every seven or eight days. After this, green copperas, an ounce, and Venice turpentine sufficient to make eight balls, mixed up with linseed flour.

DISEASES OF THE HEAD.—*Epilepsy, megrims, sturdy, or turnsick*, are epileptic attacks of greater or less violence. The epilepsy causes the horse to stop suddenly, if in action, to shake its head, look wild and irresolute. If very violent, he suddenly falls down, is convulsed, dungs and stales insensibly, and some time elapses before his recovery. Full feeding occasions it; bleeding, moderate diet, and being turned out to grass, are the remedies. *The diseases of the horse's eyes* are not numerous, but they are very destructive. The principal are ophthalmia and gutta serena. *The ophthalmia, lunatic, or moon blindness* is a very peculiar disease among horses, affecting their eyes generally about their full growth, but sometimes later, and sometimes earlier. It does not, however, appear to be a disease *natural* to the horse, as wild, or even horses little subjected to artificial restraints, are not observed to be subject to it. Amongst other horses, however, it is become so common as to have the tendency handed down in the breed; the progeny of some stallions being more prone to it than others. It is often very sudden in its attack, the eyelids being found smaller

and almost closed to avoid the light; they are also very red within, and the haw is half drawn over the surface; the tears flow down the face perpetually, and the whole head is hot, now and then these appearances come on gradually. The suddenness of the attack makes the complaint to be attributed to accident: as blows, hay, seeds within the eyes, &c., and it is frequently difficult to get the owner of such a horse to believe, that a constitutional attack, as it usually is, can come on so suddenly. Sometimes, as it comes on, so it goes off as quickly; the eye, from being opaque and milky in twenty-four hours, becomes clear and almost well. When such an attack has occurred, even if nothing be done, the horse sooner or later amends, and the eye or eyes, for it is sometimes one and sometimes both that are so attacked, become again clear and well, and remain so an indefinite period, from five or six weeks to as many months. Another attack, however, sooner or later follows, to which others succeed, each having increased milkiness on the outer coats, and some dimness within the pupil, either speck-like or diffused, and, finally, the horse becomes blind from *cataract*. When one eye goes blind totally before the other, it is often the means of preventing a future attack on the eye which remains. As this is a constitutional disease brought on by artificial habits, as over exertion, close, unhealthy confinement, and heating food; so it is clear the obstruction of all these are necessary to remove the complaint, and to prevent a recurrence, but particularly, the close, dark, and unventilated state of the stable should be attended to, as well as the removal of the litter, which retains the volatile alkali of the urine, and irritates the eyes most injuriously. The food should be mild and cooling, and the exercise moderate, but long continued. Under the height of the attack, however, rest is advisable, with moderate light, which may be still further moderated by keeping over the eye, or eyes, a thick cloth wet with goulard-water. Sometimes, one quart of vinegar to three quarts of water has been found a useful application; and, whichever is used, the eyes and eyebrows should be kept continually wet with it, which, by exciting evaporation, will keep the part cool. A seton may be introduced under the eye.

or jaw. In some cases, blistering the cheek or forehead is found useful; but, in every instance, bleeding is proper, which should be repeated until the disease lessens. When the horse is very full and gross, physic and alteratives assist the cure. When blistering is used in any part near the eye, the greater care is requisite to prevent the blistering matter from being rubbed into it. A very peculiar ophthalmic affection is also sometimes occasioned, particularly to the horses of hot climates, by the entrance of a *filuria* or thread-worm into the globe of the eye which, swimming about in the aqueous humour, eventually occasions violent inflammation. The cure consists in letting out the aqueous humour with a lancet; when the *filuria* escaping with the fluid, recovery follows. *Gutta serena*, or *glass eyes*, so called from the peculiar glassy appearance of the eye, arises from a paralysis of the optic nerve. As the eye is not materially altered in appearance, a horse often becomes blind without its being noticed, until his cautious stepping, quick motion of his ears, &c., give notice of the case. On examination, it will be found that the pupil remains dilated, however great the light, and the eye is irrecoverably lost. In the very early stages, blisters to the forehead, and stimulants to the eyes (as *white vitriol*, a *drachm*; *water*, four ounces). may be tried, but with faint hopes of success. *Pole-evil*.—This complaint commonly requires the attendance of an experienced practitioner; but the prevention is often in the power of owners, and others about horses. *Pole-evil* is commonly the effect of accident. Repeated small blows of the manger, or continued pressure from hanging back on the halter, &c., will, if not remedied, produce swelling at the nape of the neck, with some tenderness. In this early state, if the collar be removed and the part be kept continually wet with vinegar and water, the swelling will often disperse; but, if in spite of this, it proceeds to suppuration, let a vent be made for the matter by a seton, so that it may readily flow out. Introduce nothing healing, but encourage a free discharge, and it may yet heal at once. When such is not the issue, the disease attacks the ligaments, sinuses form, and the matter burrows under the skin and muscles, when a seton must be intro-

duced from the opening above and brought out at the bottom; the seton should then be daily wetted with the liquid blister. If this plan fail, escharotics will be required in the form of the *scalding mixture*.

DISEASES OF THE NECK.—*Fistulous withers* are brought on usually by pressure from a saddle, with too low or narrow a saddle-tree, and what has been said, both with regard to prevention and cure, on the subject of pole-evil, will equally apply here also. *Worms of horses* are of several kinds. *First*, bots in the stomach, but which, as they mostly attach themselves to the hard insensible part of that organ seldom do harm; it has been supposed that they actually do good. The *bot* is the larvæ of the *Cæstrus equi*, a fly which deposits its eggs, it is supposed, on the grasses on which horses feed, and, probably, on parts of the horse himself, from whence they pass into the stomach with the food, or from being licked off. Certain it is they are found in the stomach, are hatched, and there remain hanging to the coats of it by two tentaculæ, receiving the juices of the masticated food as nourishment. After a considerable time they make their way out by the anus, drop on the ground, and are first transformed into chrysalids, and afterwards into parent flies. When bots fix themselves on the sensible portion of the stomach, they may do harm, but no medicine that we know of will destroy them. The *teres*, or large round worm, sometimes occasions mischief, when it exists in great numbers, such as a staring coat, binding of the hide, irregular appetite, and clammy mouth. The best remedy is the *Spigelia marylandica*, or Indian pink, in daily doses of half an ounce. *Tenia* are not common in the horse; now and then they exist, and are best combated by weekly doses of oil of turpentine, three ounces at a time, mixed by means of the yolk of an egg with half a pint of ale. The *A'scaris*, or thread-worms, are best removed by mercurial purgatives. The existence of worms may be known by the appearance of a yellow matter under the tail, and by the disposition the horse has to rub his fundament. The following vermifuge is recommended.—*Powdered arsenic, eight grains; pueuter, or tin, finely scraped; Venice turpentine, half an ounce; make these ingre-*

dients into a ball, and give it every morning. Salt should also be given with the daily food, and it is an excellent remedy. A fact acknowledged by the residents along the sea-coast, is that horses troubled with worms will often voluntarily drink a large quantity of sea-water, and thus cure themselves.

DISEASES OF THE EXTREMITIES.—*Shoulder strains* are very rare, most of the lameness attributed to the shoulder, belong to other parts, particularly to the feet. Out of one hundred and twenty cases of lameness in the fore-extremities, it was found that *only three* arose from ligamentary or muscular extension of the shoulder. When a shoulder-strain does happen, it is commonly the consequence of some slip, by which the arm is forced violently outwards. It is less to be wondered at, than at first seems probable, that farriers mistake foot-lameness for shoulder-strains, when we reflect that a contracted foot occasions inaction, and a disposition to favour the limb by pointing it forward, which thus wastes the muscles of the shoulder. Seeing one shoulder smaller than the other, the evil is supposed to be there, and it is pegged, blistered and fired, or the horse is swam for it to his torture, and the increase of the foot's contraction by the confinement. In real shoulder-strains, the toe is dragged along the ground while in motion; at rest it is planted forward, by resting on the point of the toe. When the lameness is in the foot, the horse points his foot forward also, but he does so with the whole limb unbent, and the foot flat. These differences are highly necessary to attend to, as well as the peculiar difficulty which is always apparent in moving down hill, which he does with reluctance, and by swinging his leg round to avoid flexing it. This lameness may be further brought to the test by lifting up the fore-leg considerably, which if the evil be in the shoulder will give great pain. The muscles between the fore-legs are likewise tumefied and rendered tender in these cases. The treatment when recent, bleeding in the plate vein, rowelling in the chest, and fermenting with hot water, two or three times a day.

DISEASES OF THE FEET.—*Founder of the feet* is of two kinds, acute and chronic. *Acute founder* until lately was less understood than almost any other disease. This is occasioned by standing

in snow or cold water after being greatly heated by labour. Bleed largely from the neck, and from the foot by paring it until the blood flows freely. *Chronic founder, contraction, or fever in the feet.*—To prevent it, pare the hoofs low, let not the horse stand on litter, nor the stable to be too hot, feed moderately, and use daily exercise. The *pumiced foot* is a very common consequence of acute founder. *Corns* are most troublesome ailments, to which horses are very liable, and which injure and ruin thousands. These are not *natural* to horses, but proceed, as in human beings, from having the feet cramped by tight shoes. *Running thrush is always a dangerous disease.* *Sand Cracks* are fissures in the hoof. *Pricks, or punctures in the feet*, are often very serious evils, either when received by nails in shoeing, or by one picked up on the road. *Quittor and canker* are the consequences of these injuries when neglected, or originally extensive. *Cutting* is a defect to which some horses are liable from their form, as when they turn their toes out, or have bent legs. Others cut only when they are lean, which brings their legs nearer together. Weak horses cut because they cross their legs when fatigued, and young and inexperienced horses cut at youthful periods and grow out of it afterwards. The part in which a foot interferes with the opposed limb is very different. When it strikes the shank high up, it is called *speedy cut*, and is best remedied by wearing knee-boots or rollers. When it is at the fetlock, the cutting is at the side, or rather backward, according to circumstances. Some horses cut by the edge of the shoe, others by the hoof at the quarters, and some by the point of the heel. It is better to bear with the evil of cutting, than to pare away the hoof, until it excites contraction. Boots, or rollers, are soon put on, but continuing to cut will produce a *callus* and throw the horse down.

ON SHOEING HORSES.

The importance of the subject of shoeing, to the agriculturist, is sufficiently attested by the immense number of inventions, which the ingenuity of philosophers and artists are every day devising to render the system complete. It is plain that the principles of shoeing ought to be those that allow as

little departure from nature as circumstances will justify. The practice should be strictly consonant to the principles, and both ought to consist—*first*, in removing no parts, but those, which, if the bare hoof were applied to natural ground would remove of themselves; *secondly*, in bringing such parts in contact with the ground (generally speaking), as are opposed to it in an unshod state, and above all to endeavour to preserve the original form of the foot, by framing the shoe thereto, but never to alter the foot to the shoe. *The injurious effects of bad shoeing* only require to be known to excite every endeavour to obviate them, and there are some circumstances in the more common shoes of country smiths that ought to be impressed upon the mind of every agriculturist, and guarded against by any one who possesses a horse. *Varieties in form of the foot, difference in size, weight, and use of horses*, will necessarily make deviations in the form and substance of shoes. *To prepare the foot for the application of the shoe* is also an important consideration. *The shoes for the hind feet are somewhat different to the fore*, being a little squarer at the toe for about an inch, to which squareness the hoof is also to be adapted by rasping, avoiding however to do it injuriously. *Varieties which necessarily occur in shoeing.* The *bar-shoe* is the most important variety. As a defence to weak thin feet, it is invaluable, as it removes a part of the pressure from the heels and quarters which can ill bear it, to the frog which can well bear it; but a well-formed bar-shoe should not have its barred part raised into an edge behind, but such part should be of one uniform thickness throughout the web of the bar, which, instead of being the narrowest, should be the widest part of the shoe. In corns, this shoe is invaluable, and may then be so made as to lie off the affected part which is the great desideratum in corns. There is an abuse observable in those who shoe horses that requires notice. The blacksmith, in order to save himself a little trouble, will frequently apply the shoe red hot to the horse's foot, in order that it may burn for itself a bed in the hoof. "The utmost severity," says Lord Pembroke, "ought to be inflicted on all those who clap shoes on hot. This

unpardonable laziness of farriers, in making feet thus to fit shoes, instead of shoes to fit the feet, dries up the hoofs, and utterly destroys them." It is of the most ruinous consequence, it hardens and cracks the hoofs, and induces even the most fatal disorders.

The stable management of horses seems to be as essential to their welfare as moderate work. The constitution of horses is naturally adapted to heat, and in the vast plains of South America, where horses run wild, they disdain the aid and assistance of man; but, in England, so variable is the climate, that where horses are subjected to all kinds of weather and all kinds of labour, they require good feeding, warm stabling, and plenty of fresh litter. Their stables must be regularly and properly cleaned, fresh litter given, and the horses must be brushed and curried effectually. Stables should be well aired, and have windows in opposite sides, so that the air may pass currently through them; these should be invariably open when the horses are out of the stable, and frequently, even when the horses are in their stalls, taking care, however, never to allow cross draughts when the horses are heated, or after returning from active exercise, as this may produce cough, and other inflammatory diseases. Grooms are in the constant practice of keeping stables so completely free from air, that they even resort to the practice of closing up the bottom of the stable door with dung at night. Great warmth produces a fine glossy coat, but it is most destructive to the constitution of the horse.

The selection of farm horses adapted to particular situations is evidently a matter of primary consideration; but, whatever may be the description of horses employed, it is always a rule with good managers never to allow them to fall off in condition so much, as to be incapable of going through their work without frequent applications of the lash. There is nothing which more clearly marks the bad condition of a tenant than the leanness of his workingcattle and their reluctant movements under this severe stimulus. There are particular operations indeed, such as turnip-sowing, seeding fallows, harvest-work, &c., which require to be executed so speedily in our variable

climate, that unusual exertions are often indispensable. At these times, it is hardly possible by the richest food, and the most careful treatment, to prevent the animals from losing flesh, sometimes even when their spirit and vigour are not perceptibly impaired. Such labours, however, do not continue long, and should always be followed by a corresponding period of indulgence. It is particularly dangerous and unprofitable to begin the spring labour with horses exhausted by previous hard treatment.

The general management of farm-horses in the improved district of the North may be presented as a good example.—There, for about four months in summer, horses are fed on pastures, or on clover and rye-grass, and tares cut green and brought home to the stable or fold yard, the latter method being by far the most economical and advantageous. For the other eight months they are kept on the straw of oats, beans, and pease, and on clover and rye-grass hay. As soon as the grass fails towards the end of autumn they have hay for a few weeks, and when the days become so short as to allow of no more than from six to eight hours' work, they are generally fed with different kinds of straw according to the circumstances of the farm; in the month of March they are again put to hay till the grass is ready for being cut. Throughout all the year they are allowed more or less corn, when constantly worked, and during the time they are on dry fodder, particularly when on straw, they have potatoes, yams, or Swedish turnips, on each day, sometimes boiled barley, and, in a few instances, carrots. A portion of some of these roots is of great importance to the health of horses, when succulent herbage is first exchanged for hay at the end of autumn, and it is no less so towards the latter end of spring when hay has become sapless, and the labour is unusually severe. At these two periods, therefore, it is the practice of all careful managers to give an ample allowance of some of these roots, even though they should be withheld for a few weeks during the intermediate period. *The quantity of these different articles of food must depend on the size of the horses, the labours they perform, and the value upon the prices,*

of different seasons, and in every season on the situation of the farm with respect to markets, particularly for hay and roots, which bring a very different price near large towns, and at a few miles' distance from the markets. It is for these reasons that the yearly expense of a horse's maintenance has been estimated at almost every sum, from *fifteen to forty pounds*. It is only necessary to attend to the expense of feeding horses that are capable of performing the labour required of them under the most correct and spirited management. Such horses are fed with oats, sometimes with beans, three times a day for about eight months, and twice a day for the other four when at grass, and at the rate of eight feeds per bushel; each horse will eat fifteen quarters of oats, or twenty bolls, Linlithgow measure, in the year. When fed on hay, a horse will require about one stone of twenty-two pounds, *avoirdupoise*, daily, and five pounds more if he has no roots. One English acre of clover, rye-grass, and tares, may be necessary for four months' soiling, and a quarter of an acre of potatoes, yams, or Swedish turnips, during the eight months he is fed with hay or straw. The use of these roots may admit of a small diminution of the quantity of corn in the winter months, or a part of it may be, as it almost always is, of an inferior quality. *The expense of feeding a horse throughout the year may be estimated in regard to quantity as follows:—oats, fifteen quarters; soiling, one acre of clover, rye-grass, and tares; hay, part of October and November, March, April, and May, one ton and a quarter; straw, for other four months, half the price of hay; potatoes, yams, or Swedish turnips, one quarter of an acre.*

ON NEAT OR HORNED CATTLE.

Bos (*Bovs*, from *Bov*, to bellow, *Minshew* derives it from *בסן* abos, fat, or pampered).

Mammalia pecora. Lin. Ruminatæ, Cuv.

A genus of quadrupeds, belonging to the order of pecora, including every animal of the bull and cow kind.

The generic characters of this genus are—*horns, hollow within, and bending out laterally; eight cutting teeth in the lower jaw, and none in the upper; the skin, along the lower side of the neck,*

pendulous. The specific marks of the common bull and cow are, *rounded horns, with a large space between their bases.*

Linnaeus enumerates *six* species, but Mr. Robert Kerr, in his *Animal Kingdom, or Zoological System of Linnaeus*, describes nine species, and seventeen varieties. As he is one of the best writers on the subject, and has added every thing important from Gmelin, Pennant, and other eminent writers on Zoology, we have adopted his classification, with the exception only of the *Bonassus* and the *Indicus*, which he ranks as varieties of the *Bos taurus*, but which we cannot help considering as a distinct species, as indeed, most other writers have so ranked them; upon this account, therefore, the species we have to describe are *eleven* in number, but many of these are so nearly connected, as to render it difficult for the naturalist to assign a proper distinction between them.

The neat or horned cattle used in agriculture are included under *two* species of *Bos*; the *Bos taurus*, or ox, and the *Bos bubalus* or buffalo.

We appear to want an appropriate word in the English language to designate this class of animals. The term *horned* is far from being classical or correct, because there are several well known breeds of them which have no horns at all. The original appellation appears to have been that of *black cattle*, from whence was understood ox, bull, and cow. The reason assigned is, because formerly these animals were all entirely black, in every part of this island, and that the mixture of other colours has been wholly fortuitous, and introduced by bringing cattle across the channel from the opposite shores. In confirmation of this opinion, the Welsh breeders inform us that they have no *true-bred* cattle but what are entirely black, and that they consider the introduction of spots, or streaks of any kind, even of white, as marks of the cross of some accidental kind, and turn them out of their pure herds accordingly, to be driven to fairs or markets. It does not appear, however from experience or observation, that the colour of horned cattle is at all material in the view of general utility, unless it be that the white and coloured are less hardy than those of the pure black.

These animals are more universally used, especially on the continent, as beasts of draught and burden than the horse, and have the additional advantage of furnishing excellent food and other valuable products. There is scarcely a country in which the ox, or the buffalo, is not either indigenous, or naturalized and cultivated, while, in many parts of the world, the horse is either wanting or reserved for the purposes of war or the saddle. The animals of this tribe are seldom found, except in low and rich pastures and plains, or in swamps and morassy grounds. In size and bulk they exceed all the British quadrupeds, except the horse. Their services to mankind are more considerable than even those of the sheep; for, in addition to the qualifications of the latter, they are employed as beasts of draught and burden. Their voice is called *lowing* and *bellowing*. They fight by pushing with their horns, and kicking with their feet.

1. *Bos BUBALUS* (the common buffalo). The *buffalo* is described by Aristotle as a wild ox. It is the *bos indicus* of Pliny, and *le buffle* of Buffon. It is considerably larger and stronger than the ox. His horns extend for a considerable length in an horizontal direction from their bases and then bend upwards; they are not round but flattened, and sharp on one side. His skin is mostly black; hair, thin and short, and his forehead adorned with a tuft of curling hair. The body of the buffalo is thicker and shorter, his legs longer, and his head smaller in proportion to the size of his body than that of the ox; his ears, also, are larger, and his skin thicker and harder. His eyes are white, his nose broad and square, and he has no dewlaps. His body is of a square form, and his tail shorter and more slender than that of our common cattle. The horns of these animals are sometimes amazingly large. In the British Museum, there is one six feet, six inches and a half long, weighing twenty-one pounds, and sufficiently capacious to hold five quarts. Labo mentions some in Abyssinia which would hold ten quarts, and Dillon saw some buffaloes' horns in India ten feet long. This animal is to be found in a tame and wild state. The wild buffalo is very fierce and dangerous if

attacked. He is afraid of fire, and highly provoked at the sight of any thing red coloured. He delights to wallow in mud, is fond of the banks of rivers, and an excellent swimmer. Even the tame buffalo is often a violent and intractable animal; next to the hog he is the dirtiest of domestic cattle, ungraceful in his appearance, and awkward in his motions. His voice is deeper and stronger than that of the bull, and his bellowing hideously frightful. Notwithstanding the general resemblance which the form of the buffalo bears to that of the common cattle they are a distinct species. They refuse to copulate together, the female buffalo will not suffer a common calf to suckle her, nor will the cow suckle a young buffalo; the female goes twelve months with young, our cows only nine. The milk is inferior to that of the cow, but used for the same purposes, and in those countries where they are domesticated a considerable quantity of cheese is made from the milk they yield. The flesh is eaten, but some authors assert that it is black, hard, and of a disagreeable taste, and not to be compared to beef. The only part that can be called good eating is the tongue; others say the flesh is excellent, and is so free from any disagreeable smell or taste, that it nearly resembles beef. The flesh of the cows, when some time gone with young, is esteemed the finest; and the young calves are reckoned by the Americans the greatest possible delicacy. The skin is very valuable: it is solid, rather flexible, almost impenetrable, and makes excellent buff leather. The horns are employed in various manufactures. The strength and size of the buffalo render him superior to the ox as a beast for draught. A ring passed through his nose enables the driver to manage him. He carries his head and neck low, and consequently the whole strength of the body is employed in drawing. These advantages of size and carriage are so considerable that two buffaloes will draw as much as four strong horses. The buffalo is a native of warm climates. They abound in India, Abyssinia, Egypt, near the Cape of Good Hope, and in Italy. These animals are found also in a wild state in Malabar, Borneo, and in Ceylon. The negroes in Malabar and Guinea are fond of hunting

them, and in those places these animals are numerous. The negroes mount a tree, or hide in a thicket, and shoot the buffaloes as they pass. In Abyssinia, the buffalo grows twice as large as our ox. On account of his size, and of the thickness and blackness of his skin, he is there called *taurelephas*. In India, he is more peaceable and tractable when tamed than in any other country. In Egypt, also, this animal is sufficiently docile. In many parts of the East, as well as in Italy (where they constitute an essential part both of the riches and food of the poor), buffaloes are domesticated and used for the same purposes as black cattle in other countries. It is said to be a singular sight to observe, morning and evening, large herds of them cross the Tigris and Euphrates. They proceed, all wedged against each other, the herdsman riding on one of them, sometimes standing upright, and sometimes couching down; and, if any of the exterior ones are out of order, he steps lightly from back to back, to drive them along. The skin and horns of the buffalo are its most valuable parts; the former is very strong and durable, and consequently is well adapted for various purposes in which a strong leather is required. The latter have a fine grain, are strong, and bear a good polish; and are, therefore, much valued by cutlers and others.

In the Cœlebes there is an animal of the size of a middling sheep, which appears to be a variety of the buffalo. It is called *bos bubalus anoa*, is a gregarious animal, and found in small herds on the mountains of those islands which abound in caverns. It is exceedingly difficult to take any one of these creatures, and even in confinement they are so remarkably fierce as to rip up the bellies of stags kept in the same paddocks. In the island of *Sumatra*, in the East Indies, the buffalo, called by the natives *carbou*, is the principal domestic animal. The buffalo of that island seems to possess some peculiar characteristics, and must therefore be regarded as a distinct variety. It has a large heavy body, short legs, and large hoofs; its horns turn backwards, but some point forwards, and are always in the plane of the forehead. The tail is slender, reaches only to the middle joint of the leg, and terminates in a bunch of hair. The female goes

nine months with calf, and suckles the calf six. When crossing a river she carries her young on her back. The voice of the animal is a weak sharp cry, very unlike the lowing of oxen. These buffaloes, as well as those of other countries, delight to wallow in the mud, and will swim over the broadest rivers. During the inundations, they will dive ten or twelve feet deep, to force up with their horns the aquatic plants, and eat them swimming. They display great dexterity in throwing the water with the horns over their back and sides, when there is not sufficient depth to cover them. The mud, mixed with the water, forms a crust on their skins, by which they are preserved from the stinging of insects, and, as their hair is very thick, these insects are very troublesome to them.

Of these *Sumatran* buffaloes, there are two varieties, the white and the black. Both are employed for labour, but the white are seldom killed for food. Different reasons have been assigned for this exemption: some of the natives say that the white are suffered to live uninjured, because they are accounted sacred; others that the only reason is the inferior quality of their flesh. Wild buffaloes are also found on the same island. They are considered not as an originally wild breed, but as stray cattle, and are therefore distinguished by the name of *carbou gellon*. They are gregarious, and it is remarkable, that in herds they are not so ready to attack the passenger as when met singly. Like the turkey, they discover an antipathy to red colours. They are as swift in running as an ordinary horse. When alarmed or attacked, they flee for a short distance, then face about, and form into a regular body; and, when the cause of their apprehension advances nearer, again take to flight; thus they alternately retreat and face about until they gain some place of security. Among the inhabitants of the forest, the tiger is their principal enemy, but only the females, and the weaker males, fall a prey to his rapacity.

2. *Bos CAFER* (The Cape buffalo). Inhabits the interior part of Africa, north of the Cape of Good Hope, but does not extend to the north of the Tropics. In the neighbourhood of the Cape of Good Hope, droves of wild buffaloes are fre-

quently met with, which form a different variety of this species, and were first described and delineated by Dr. Sparrman, in the *Swedish Transactions*, under the name of *bos caffer*, and in his *Travels* under the common name. By former natural historians they had scarcely been noticed. The animal, which Sparrman describes, was "eight feet long, and five feet and a half high, its fore-legs two feet and a half long; its larger hoofs five inches in diameter, and the head, between the tip of the muzzle and the bases of the horns twenty-two inches. In shape it bore a considerable resemblance to the common ox, but its limbs were stouter, and its fetlocks hung nearer to the ground. The orbits of the eyes are prominent, and the eyes somewhat sunk within them. This hollowness of the eyes, their situation almost under the bases of the horns, and the inclined position in which the animal generally holds its head, give it a fierce and treacherous aspect. They are indeed remarkably ferocious." The savage disposition, large size, and enormous strength of these animals, render them too well known in all the countries which they inhabit. In the plains of Caffraria they are so common that it is by no means unusual to see a hundred and fifty or two hundred of them in a herd. They generally retire to the thickets and woods in the day-time, and at night go out in the plains to graze. Treacherous in the extreme, they frequently conceal themselves among the trees, and there stand lurking till some unfortunate passenger comes by, when they at once rush into the road and attack the traveller, who has no chance to escape but by climbing up a tree, if he is fortunate enough to be near one. Flight is of no avail: he is speedily overtaken by the furious beast, who, not contented with throwing him down and killing him, stands over him even for a long time afterwards, trampling him with his hoofs, and crushing him with his knees. He not only mangles and tears the body to pieces with his horns and teeth, but likewise strips off the skin by licking it with his tongue. Nor does he perform all this at once, but often retires to some distance from the body, and returns with savage ferocity to gratify afresh his cruel inclination.

As Professor Thunberg was travel-

ling in Caffraria, he and his companions had just entered a wood, when they discovered a large old male buffalo lying quite alone, in a spot that for the space of a few square yards was free from bushes. The animal no sooner observed the guide, who went first, than with a horrible roar he rushed upon him. The fellow turned his horse short round behind a large tree, and the buffalo rushed forward to the next man and gored his horse so dreadfully in the belly that it died soon afterwards. These two men climbed into trees, and the furious animal made his way towards the rest, who were approaching, but at some distance. A horse without a rider was in the front. As soon as the buffalo saw this animal he became more outrageous than before, and attacked him with such fury, that he not only drove his horns into the horse's breast, but even out again through the very saddle. At this moment the Professor happened to come up, but from the narrowness of the path, having no room to turn round, he was glad to abandon his horse and take refuge in a tree. The buffalo however had finished, for after the destruction of the second horse he turned suddenly round and galloped away. Some time after this the Professor and his party espied an extremely large herd of buffaloes grazing on a plain. Being now sufficiently apprized of the disposition of these animals, and knowing that they would not attack any person in the open plains, they approached within forty paces and fired amongst them. The whole troop, notwithstanding the individual intrepidity of the animals, surprised by the sudden flash and report, turned about and made off towards the woods. The wounded buffaloes separated from the rest of the herd, and amongst these was an old bull buffalo, which ran with fury towards the party. They evaded his attack, and he galloping close by them, soon after fell. Such however had been his strength, that notwithstanding the ball had entered his chest, and had penetrated nearly through his body, he had run at full speed several hundred paces after he had been wounded. Notwithstanding his ferocity, the buffalo is hunted at the Cape of Good Hope both by Europeans and by the natives of South Africa; but the hunter who attacks him must be well mounted, for

he often turns upon his pursuer and attacks him with impetuosity. It is not easy to escape unless by riding up some hill, which the bulk of the buffalo and the shortness of his legs render him incapable of ascending with the same speed as a good horse. In Caffraria he is generally killed by means of javelins, which the inhabitants use with considerable dexterity. When a Caffre has discovered the place where several buffaloes are collected together, he blows a pipe made of the thigh-bone of a sheep, the sound of which is heard at a great distance. The moment his comrades hear this notice they run to the spot, and surrounding the animals, which they take care to approach by degrees, lest they should alarm them, throw their javelins at them. This is generally done with so sure an aim, that out of eight or twelve it rarely happens that a single one escapes. When the chase is ended, each man cuts off and takes away his share of the game. Some Europeans at the Cape, once chased a buffalo, and having driven him into a narrow place, he turned round and instantly pushed at one of his pursuers who had on a red waistcoat. The man, to save his life, ran to the water, plunged in, and swam off: the animal followed him so closely that the poor fellow had no alternative but that of diving. He dipped over head, and the buffalo losing sight of him, swam on towards the opposite shore, three miles distant, and, as was supposed, would have reached it, had he not been shot by a gun from a ship, lying at a little distance. The skin was presented to the governor of the Cape, who had it stuffed and placed among his collection of curiosities. These buffaloes appear to be of a very hot constitution: they delight to wallow in the mire; and when heated in hunting plunge eagerly into the first stream, or pool, or piece of water, of whatever kind, whether salt or fresh, which they happen to approach. Various attempts have been made to tame this species of the wild buffalo, but it does not appear that any of them have succeeded. These animals are found also in the interior parts of Guinea, but so fierce and dangerous are they that the negroes who chase other animals are afraid of shooting at them. *The Lion which can break the back of the strongest domestic ox, at*

one blow, cannot kill the buffalo except by leaping on its back, and suffocating it by fixing its talons about its nose and mouth. The lion often perishes even in this attempt, but leaves the marks of his fury upon the nose of the animal he has attacked. The Hottentots, who never put themselves to any great trouble in dressing their victuals, cut the buffalo's flesh into slices, and then smoke and at the same time half broil it over a few coals. They also frequently eat it in a state of putrefaction. They dress the hides by stretching them on the ground with stakes, afterwards strewing them over with warm ashes, and then with a knife scraping off the hair. The flesh of the buffalo is coarse and not very fat, but full of juice, and of a high and not disagreeable flavour. The hide is thick and tough, and is in great request with the farmers for thongs and harness, being the only halters that can be depended upon for securing horses and oxen, so that they cannot get loose by snapping them asunder, which they are otherwise apt to do when the lions and wolves make their appearance in the neighbourhood.

3. "BOS ARNEE," says Mr. Kerr, "has long erected semilunar horns, which are flattened, annularly wrinkled, with smooth, round, approaching points; and inhabits India, north from Bengal. This animal is of vast size, and is hitherto nondescript. A skeleton of the head with the horns is in the Edinburgh College Museum." A British officer, who met with one in the woods above Bengal, says, "it is about fourteen feet high, that it partakes of the form of the horse, bull, and deer, and is very bold and daring." This establishes its genus, as all the other horned animals of the ruminant or cloven-foot tribe are shy and timid. This is by far the largest animal of the cattle tribe that has hitherto been discovered, its usual height being from *ten to fifteen feet*. It is an inhabitant of various parts of India north of Bengal, and is very seldom seen within the European settlements. A herd of Arnees was, not many years ago, observed by a body of British troops in one of the inland provinces of Hindoostan, and they excited no small alarm in the whole corps. The herd no sooner perceived the men advancing than they lifted up their heads, ran off

to a small distance, then wheeled about, seemingly to reconnoitre, and advancing in a body, as if to attack, had such a formidable and warlike appearance, and withal of a kind so entirely new, that no person present could form an idea what it might mean. Their horns, each at least two feet long, rose to a great height in the air, and did not permit the troops to see distinctly whether men were mounted on the animals or not; but in a short time they galloped off and disappeared. Upon an inquiry made by Dr. Anderson of gentlemen who had been in India, respecting cattle of large size in that part of the world, some of them mentioned animals of this kind, which they said were kept by the native princes chiefly for parade, under the name of *fighting bullocks*. A convincing proof that these animals are kept by the princes, and probably for parade, is obtained from an Indian painting, in which three of them are very distinctly delineated. This painting represents one of those entertainments that are given by the Indian princes for the amusement of their subjects, similar to the fights that were exhibited for the same purpose on the arena at Rome. An elephant is figured in the act of contending with two tigers, and among the number of objects assembled there are three Arnees: these appear to be waiting apart, each under the guidance of a leader, who is seated upon his back, and has hold of a bridle in the animal's mouth. This painting is the property of Gilbert Innes, Esq., of Stow, near Edinburgh.

4. *Bos BARBATUS* (the bearded Ox, or Cape Auroch), has short horns, a beard on the chin, whence the name and curly hair on the breast. It inhabits the country north of the Cape. The Namaquas call it *baas*, or the *master courier*, on account of its vast swiftness. It is like the common ox, but larger, and of a gray colour. The head is small.

5. *Bos BONASSUS* (has a long mane, its horns are bent round towards the cheek, and not above a span long). It is about the size of a large bull, and is a native of Africa and Asia.

6. *Bos GRUNNIENS* (York, or hog cow). Has short, erect pointed, cylindrical horns, bent outwards. The body is so hairy, that the hair hangs down upon its knees like a goat. The colour of

the body is black, but the front is white. It has bristles on its back and hind legs, and it grunts like a hog. The tail resembles that of a horse, and is covered with very long flowing silky hairs. It is an inhabitant of the north of Asia.

They are a very valuable property to the tribes of itinerant Tartars, called Duckba, who live in tents and tend them from place to place: they at the same time afford their herdsmen an easy mode of conveyance, a good covering, and wholesome subsistence. They are never employed in agriculture, but are extremely useful as beasts of burden; for they are strong, sure-footed, and carry a great weight. Tents and ropes are manufactured of their hair; and amongst the humbler ranks of herdsmen, caps and jackets are made of their skins. Their tails are esteemed throughout the East, as far as luxury and parade have any influence on the manners of the people. In India no man of fashion ever goes out, or sits in form at home, without two *chourabadars*, or *brushers*, attending him, each furnished with one of these tails mounted on silver or ivory handles, to brush away the flies. The Chinese, dye them of a beautiful red, and wear them as tufts to their summer bonnets.

The yak is the most fearful of animals, and very swift; but when chased by men or dogs, and finding itself nearly overtaken, it will face its pursuers and hide its hind parts in some bush and wait for them; imagining if it could conceal its tail, which was the object they were in search of, it would escape unhurt.

Mr. Kerr enumerates four varieties of this species, *viz.* 1. *Bos grunniens ecornis*: 2. *Bos grunniens ferus*, the wild grunting ox: 3. *Bos grunniens ghainouk*, a domesticated variety of the wild breed: 4. *Bos igrunniens sarlyx*, a degenerated race, not particularly described.

7. *Bos PUMILUS* (the dwarf ox), a species but very imperfectly known. Its form has been described, but with its character we are unacquainted. Nay we scarcely know of what region of the earth it is a native. The few particulars of its history, that are related by natural historians, were originally communicated by the French traveller Belon, who saw an individual of the species at Cairo. Its horns recede in the middle; almost meet at the points, and stand

erect. It is in size between the roebuck and the stag. Its limbs are well shaped, and duly proportioned. Its hair is of a tawny brown colour and glittering. Its legs are short; its limbs thick; and its shoulders a little elevated. The end of its tail is adorned with long hairs, twice as coarse as the hairs of a horse's tail. Belon relates that the animal he saw was brought from Asamie or Azafi, a maratime province of Morocco. Mr. Pennant suspects that it may be a variety of the *lant* of Leo Africanus. Belon thought this the *bulbus* of the ancients. M. Buffon confounds it with the *zebu*, or small Indian ox. Probably the only pair of these curious animals ever brought into England, were those which the late Warren Hastings, Esq. sometime Governor General of India brought from thence, and which we recollect to have seen at Daylesford in Oxfordshire, about the close of the last century. Daylesford was the native place of Mr. Hastings.

8. *Bos INDICUS* (the Indian ox), with all its varieties, are considered by Gmelin, as varieties of the *Bos Taurus*; but, as Mr. Kerr observes, "many of them have such remarkable differences as would constitute, in other genera, sufficient marks for specific distinction." They have a large fatty lump on the shoulders. They differ much in size and in the form of their horns.

Some are very large, and of a reddish colour; with horns short and bending close to the neck, others very small, with horns almost upright, bending a little forward. The following are the chief varieties: 1. *Bos Indicus Major*, with short horns bending backward, inhabits India, Africa, and Madagascar: 2. *Bos Indicus Minimus*; it inhabits Surat, and is used to draw children in small carts: 3. *Bos Indicus Minor*, the Zebu, or little Indian Buffalo, with short erect horns turned a little forwards, and a lump on the shoulders. It is the common beast of burden in India.

9. *Bos MOSCHATUS* (the musk ox, of Hudson's Bay). Is about the size of a Scotch bullock, has a thick body and short legs. The horns are large, and are united at their origin in the skull; but immediately after, they fall down on each side of the crown of the head, then taper away small, the points turning up, and out. The horns of an old bull are about two feet in length, as well as

in circumference, and weigh about thirty pounds each. The hair is black and grows to a great length; underneath which is a very fine ash coloured wool. The male only has the curious scalp, the female is covered with hair. They live in herds from *thirty to eighty* or *one hundred*. The bulls are very few in proportion to the cows. It is rare to see more than two or three full grown bulls with the largest herds; and from the number of males which at times are found dead, the Indians are of opinion that they kill each other in contending for the females at the rutting season.

Captain Edward Sabine, who accompanied Captain Parry in his expedition to discover a north west passage in the years 1819—1820, informs us that "This species of ox inhabits the North Georgian Islands in the summer months, but being less numerous than the rein-deer, and more difficult to approach, three individuals only were killed, all of which were bulls. They arrived in Melville Island in the middle of May, crossing the ice from the southward, and quitted it on their return towards the end of September. The musk ox may be further stated on Esquimaux's information, to inhabit the country on the west of Davis's Strait, and on the north of Baffin's Bay: as a head and horns, and a drawing of a bull being shown to the Esquimaux of the west coast of Davis's Strait, who were communicated with on the 17th of September, were immediately recognised, and the animal called by the name of Umingmack; this is evidently the same with the Uimak of the Esquimaux of Wolstenholme Sound, who were visited by the former expedition, and of which nothing more could be learnt at the time from their description than that it was a large horned animal inhabiting the land, and certainly not a rein-deer. It is probable that the individuals which extend their summer migrations to the north east of Baffin's Bay, retire during the winter to the continent of America, or to its neighbourhood, as the species is unknown in South Greenland. There can be no doubt that it was the head of an animal of the present species, which is described in the *Fauna Grælandica*, to have been conveyed on a piece of ice to the shores of Greenland, and which is there erroneously conjectured to have belong-

ed to the *Bos grunniens*. It is a curious fact however, that although none of the Greenlanders had ever seen the animal to which the head belonged, they should have given it the same name of *Umimak*, as is mentioned by O. Fabricius; this fact may seem to justify an inference that the animal itself was known to them by tradition; and may thus in some measure corroborate the general belief that their ancestors came from a country to the north and west of that which they now inhabit.

The flesh of the bulls which were killed in the expedition was generally liked, although tasting strongly of musk. The weight of each individual exceeded *seven hundred* pounds, yielding about *four hundred* pounds of meat; the head and skin weighed *one hundred and thirty* pounds; the animals stood ten hands and a half high at the withers." A very correct representation of the bull is given in a plate, from a drawing of Lieutenant Beachey's. The projection of the orbit of the eyes in this species is very remarkable, when compared with others of the same genus; it is probably a provision to carry the eye clear of the great quantity of hair, which the severity of the cold renders necessary in such high latitudes. There is a fine specimen of this animal preserved in the British Museum.

10. *Bos AMERICANUS* (the Bison or wild bull of America), which is found to be of the same race as the wild cattle of Europe, and which was the only animal analogous to the domestic kinds, found by the Europeans, on their arrival in the new world. It has short black rounded horns, with a great interval between their bases. On the shoulders is a vast bunch, consisting of a fleshy substance, and much elevated. The fore-parts of the body are thick and strong; the hind-parts comparatively slender and weak. The bunch and head are covered with a very long undulated fleece, divided into locks of a chesnut colour; this is so long at times as to make the forepart of the animal look of a shapeless appearance, and almost to obscure its sense of seeing. During winter, the whole body is clothed in the same manner, but in the summer the hindpart of the body becomes naked, wrinkled and dusky. The tail is about a foot long; at the end is a tuft of black hair, the

rest naked. Long shaggy hair also hangs from the chin, and the dewlap; and is continued under the neck and throat. The cow is smaller than the bull, and not arrayed in the same shaggy covering. These animals weigh from 1600 to 2900 pounds. Their most northern residence is in the countries *six hundred miles* west of Hudson's Bay. They are frequently seen in immense herds at Cibloe, a little north of California; in New Mexico, in Canada, to the west of the lakes, and in the rich savannahs or pastures which lie along the Mississippi, and the other great rivers that fall into it.

They feed in the open savannahs morning and evening, and retire during the sultry parts of the day to rest, near shady rivulets and streams of water. In the moist land they frequently leave so deep an impression of their feet, as to be traced and shot by the artful Indians, to whom the chase of these animals is a favourite diversion. They employ very ingenious arts to deceive the observation of the bison and to elude his fury, and they do this so successfully, that one hunting party kills several hundreds of them in a season. In this undertaking, however, it is necessary that the men should be particularly careful, although while unmolested they are shy and inoffensive, yet when they are only wounded these animals become excessively furious. The hunters go against the wind, as the faculty of smell in the bison is so exquisite, that the moment they get scent of their enemy they retire with the utmost precipitation. In taking aim the hunter directs his piece to the hollow of the shoulder, by which means he generally brings down the animal at one shot; but if not killed, the bison immediately runs upon him, and with its horns and hoofs tears him in pieces, or tramples him to death.

These animals are so amazingly strong, that when they flee through the woods from a pursuer, they frequently brush down trees as thick as a man's arm; and, be the snow ever so deep, such is their strength and agility, that they are able to plunge through it much faster than the swiftest Indian can run in snow shoes. "To this," says Mr. Hearne, "I have many times been an eye-witness. I once had the vanity to think that I could have kept pace with them; but, though I was at

that time celebrated for running fleetly in snow shoes, I soon found that I was no match for the bisons, notwithstanding they were then plunging through such deep snow, that their bellies made a trench as large as if many heavy sacks had been hauled through it."

In Canada, the hunting of the bison is a common employment of the natives. They draw up in a large square, and commence their operations by setting fire to the grass, which at certain seasons, is very long and dry. As the fire burns onward, they advance, closing their ranks as they proceed. The animals, alarmed by the light, gallop confusedly about till they are hemmed in so close, that frequently not a single beast is able to escape.

In Louisiana, the men mount on horseback, each with a sharp, crescent-pointed spear in his hands. They approach with the wind, and as soon as the animals smell them, they instantly seek to escape; but the sight of the horses moderates their fear and the majority of the bisons are, at a certain time of the year, so fat and unwieldy, as easily to be enticed to slacken their pace. As soon as the men overtake them, they endeavour to strike the crescent just above the ham, in such a manner as to cut through the tendons and render them afterwards an easy prey.

The hunting of these animals is also common in several parts of South America. It commences with a sort of festivity, and ends in an entertainment, at which one of their carcasses supplies the only ingredient. As soon as a herd of bisons is seen on the plain, the most fleet and active of the horsemen prepare to attack them, and, descending in the form of a widely extended crescent, they hunt them in all directions. After a while the animals become so weary, that they seem ready to sink under their fatigue; but the hunters, still urging them to flight by their loud cries, drive them at last from the field. Such as are unable to exert the necessary speed for escape are slaughtered.

The sagacity which a herd of bisons exhibit in defending themselves against the attacks of wolves is admirable. When these ravenous creatures approach, they immediately form themselves into a circular body; the weaker in the middle, and the stronger on the

outside. Their horns then present to the enemy an impenetrable front; when taken by surprise, many of the fittest and weakest unavoidably perish.

The affection of the calves for their mothers is very striking. There is, says Mr. Turner (who resided long in America), a singular and affecting trait in the character of this animal when a calf. Whenever a cow bison falls by the murdering hand of the hunter, and happens to have a calf, the helpless young one attempts not to escape, but stays by its fallen dam, exhibiting signs of strong natural affection. The dam thus secured, the hunter makes no attempt on the calf, knowing it is unnecessary, but proceeds to cut up the carcass: then, laying it on his horse, he returns home followed by the poor calf, thus instinctively attending the remains of its dam. I have seen a single hunter ride into the town of Cincinnati, between the Miamies, followed in this manner by three calves who had lost their dams by this cruel hunter. The hunters are too apt to destroy them wantonly, a circumstance much to be regretted, and not to be prevented. Frequently is this fine animal needlessly killed, and, excepting the tongue and the tallow, left on the ground a prey to the wolves and eagles.

Mr. Turner is of opinion that the bison is superior to our domestic breed for the valuable purposes of husbandry, and says, "Since I have expressed a wish to see the bison domesticated on the English farms, I will mention a fact concerning it within my own knowledge. A farmer on the great Kenhawa, broke a young bison to the plough, and having yoked it with a steer taken from his tame cattle it performed to admiration. Inquiring of the ploughman if he had any fault to find with the bison, he answered, 'there was but one objection to it; the step of the bison was too quick for that of the tame steer.'—'My friend,' said I, 'the fault lies not in the bison, but in the steer, what you term a fault in the former is really an advantage in its favour.' Till this moment, the man had laboured under one of those clouds of prejudice, but too common among farmers. He had taken the ox of his father's farm, as the unit whence all his calculations were to be made, and his conclusions drawn: it was his un-

changeable standard of excellence, whether applied to the plough or the draft. No sooner was my observation uttered than conviction flashed on his mind, and he acknowledged the superiority of the bison.' The strength of the bison, also, is greatly superior to that of the domesticated ox, and when properly broken in, his activity is much superior. I should not think it unreasonable (continues this gentleman) to assign nearly a double portion of strength to this powerful inhabitant of the forest. Reclaim him, and you gain a capital quadruped, both for the draught and for the plough; his activity peculiarly fits him for the latter in preference to the ox."

The uses of the bison when dead are various. Powder-flasks are made of the horns, they are also used for drinking cups. The skin, when properly dressed, makes excellent buff leather, and, when dressed with the hair on, serves the Indians for clothes and shoes. The Europeans of Louisiana use them for blankets, and find them light, warm, and soft. The flesh is used as food, and the bunch on the shoulders is esteemed a great delicacy. The tongues are cured and transported to New Orleans, where they are sure to meet with a good market. The bulls when fat, frequently yield each one hundred and fifty pounds weight of tallow, which forms a considerable article of commerce. The hair is spun into gloves, stockings, and garters, that are very strong, and look as well as those made of the finest sheep's wool. Pownall assures us that a most luxurious kind of fabric might be manufactured from it. The fleece of one of these animals has been found to weigh eight pounds.

11. **BOS TAURUS** (the domestic bull and cow), has cylindrical horns bent downwards, and loose dewlaps. The bull, or male, is naturally a fierce and terrible animal. When chafed, he has an air of sullen majesty, and often tears up the ground with his feet and horns. The principal use of the bull is to propagate the species, although he might be trained to labour, his obedience cannot be depended on. A bull, like a stallion, should be the most handsome of his species. He should be large, well made, and in good heart; he should have a black eye, and a fierce

aspect, but an open front, a short head, thick fleshy legs, and a long tail well covered with hair. Castration remarkably softens the nature of this animal, it destroys all his fire and impetuosity, and renders him mild and tractable without diminishing its strength; on the contrary, after this operation, his weight is increased, and he becomes fit for the purposes of ploughing, &c. The females of all those species of animals which we keep in flocks, and where increase is the principal object, are much more useful than the males. The cow produces milk, of which butter, cheese, &c., is made, which are principal articles in our food, and besides answer many useful purposes in various arts. Cows are generally in season and receive the bull from the beginning of May to the middle of July. Their time of gestation is nine months, which naturally brings the veal to our markets from the beginning of January to the end of April. However, luxury has fallen upon methods of interrupting this natural course, and veal may be had almost every month in the year. Cows, when improperly managed, are very subject to abortion. In the time of gestation, therefore, they ought to be observed with more than ordinary care, lest they should leap ditches, &c., neither should they be suffered to draw in the plough or other carriage. They should be put into the best pasture, and should not be milked for six weeks or two months, before they bring forth their young. The cow comes to the age of puberty in eighteen months, but the bull requires two years, and it is better to restrain them till they be full three years. From three to nine years these animals are in full vigour, but, when older, they are fit for nothing but to be fed for the butchers. A milch cow ought to be chosen young, fleshy, and with a brisk eye. *The criteria of a beautiful cow* is thus described:—

She's long in her face, she's fine in her horn,
She'll quickly get fat without cake or corn;
She's clear in her jaws, and full in her chine,
She's heavy in flank, and wide in her loin.

She's broad in her ribs, and long in her rump,
A straight and flat back with never a hump;
She's wide in her hips, and calm in her eyes,
She fine in her shoulders, and thin in her thighs.

She's light in her neck, and small in her tail,
She's wide in her breast, and good at the pail;
She's fine in her bone, and silky of skin,
She's a grazier's without, and a butcher's within.

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A good cow has wide horns, a thin head and neck, dewlap large, full breast, broad back, large belly, the udder capacious, but not too fleshy, tail long and pliable, legs proportionable to the size of the carcass, and the joints short. She should also have a gentle disposition, a temper free from any vicious tricks, and perfectly manageable on every occasion. *The criteria of excellence in cattle, as derived from colour*, is of no importance, and all that need be said is, that the black haired are hardier than the white and red. The hair should be glossy, thick, and soft; when otherwise, the animal is either not in health, or has a weak constitution. *The terms applied to the different ages* are as follows:—A young castrated male, after the first year, is called a *stirk*; when a year older, a *stot*, or *steer*; at five years old, an *ox*. A female, after the first year, is called a *heifer*, or *quey*; when about to bring a calf, she is called a *young cow*. Certain of the Welsh and Scots cattle, of rather a coarse and sturdy kind, are called *runts*. *Bullock* is the general term for any full-grown male cattle, fat or lean. *In point of utility and profit*, no single animal can stand in competition with the cow. Her milk, so indispensable to civilized man, is her most precious product, and of which the value in various forms is so universally and feelingly understood. Of this real liquor of life, more valuable than the richest wines, the cow will give the amount of *many times her weight* in the course of a year, and every year she continues in a constant state of re-production unto the end of her life, when her last gift to man is food of the most substantial kind, and so many articles of various use, that no part of her carcass need be wasted or lost; the worth of these often replaces her original cost. From the circumstance of these animals furnishing the Gentoos with milk, butter, and cheese, their favourite food, that people entertain for them a most superstitious veneration. There is scarcely a Gentoos to be found who would not, were he under a forced option, prefer sacrificing his parents or children to the slaying either of a bull or cow. Believing in the doctrine of transmigration, they are also alarmed at the idea of injuring the souls of those of their

fellow-creatures that have taken their abode in these animal cases. This also tends to restrain them from destroying, designedly, any of the brute creation, and to prevent them from dispossessing any being of that life which God alone can give; and they respect it in the flea equally with the elephant. From this animal are derived the numerous varieties of cattle that are found in various parts both of the old and new Continents. In its wild state it is distinguished by its great size, and the shagginess of its hair, which about the head, neck, and shoulders, is sometimes so long as to reach almost to the ground. The horns of the wild ox are short, sharp-pointed, strong, and stand distant from their bases. The general colour of its body is either a dark or a yellowish brown. The limbs are strong, and the whole aspect savage and gloomy. Wild oxen are found in the marshy forests of Poland, among the Carpathian Mountains in Lithuania, and also in several parts of Asia. The value of the flesh of the ox, whether in a fresh or salted state, is too well known to be mentioned here. His tallow contributes to double the number of our days—his joints give us oil—his hide, leather of the strongest kind—his hair helps to cement the walls of our dwelling—of his horns are made combs and toys—of his teeth buttons—his bones are a chief substitute for ivory, and their ashes serve to refine silver—his large full eye is instrumental to the discoveries of the anatomist, and his blood, gall, and urine, are useful in manufactures, medicine, and manuring the soil. *The arguments for and against the working of oxen* have been carried to a great extent. Lord Kaimes in the last century, and Lord Somerville in the present, may be considered the principal advocates for the ox. To their arguments and to all others, the following objections have been stated by the able author of the Supplement to the sixth edition of *The Gentleman Farmer*, and they may be considered as conveying the sentiments, and according with the practice, of all the best informed and most extensive British farmers.—*The first objection to oxen is*, that they are unfit for the various labours of modern husbandry, for travelling on bad roads in particular, for all distant carriages, and generally for every kind of work

which requires dispatch: and what sort of work does not often require it in this variable climate? There is one cause, more important perhaps than any other, why oxen have ceased to be so employed by the farmer is, that his teams of horses are capable of performing every sort of work, he brings them all to bear for a time upon the most important labours of every season; and when that is dispatched, or interrupted by unfavourable weather, the less urgent branches are speedily executed by the same means. *Another objection is*, that an ox-team (capable of performing the work of two horses), even such kind of work as they can perform consumes the produce of considerably more land than the horses.

Though horned cattle are gradually disappearing as beasts of labour, it is probable they will in many places be occasionally used as a substitute for horses, or to get up one or two additional teams on extraordinary occasions. Indeed we see no objection to the occasional use of both oxen and cows for this purpose; we shall therefore notice the training, harnessing, shoeing, age of being put to work, and general treatment of these animals so employed. *The training* of the calf intended for labour, according to some, should commence at an early period, and be taught to present his foot to the shoeing-smith as readily as the horse. No animal, however, is so easily broke as the ox at any age. *Working oxen, when kept in a house*, are generally confined to their places by the same sort of fastening used for cows. *Harness for labouring cattle is of three kinds*; that for bearing, as saddles, some sorts of oxen yokes; that for drawing or pushing, as traces, &c.; and that for guiding the animals, as bridles, halters, reins, &c. These articles are of considerable expense, but when taken care of, kept dry, and the iron joints and leathers oiled occasionally, they will last a long time. *The most approved kind of harness* for the ox is little different from that of the horse, except in the shape of the collar. In making all kinds of harness for beasts of labour, great care ought to be taken to avoid superfluous materials, which only encumber; are ornamental, but merely add to the expense. The harness made in London is generally

much too heavy for agricultural purposes; that of Berwick and Newcastle is much lighter, and sufficiently strong. *The shoeing of oxen* is a practice which as yet is far from being performed in a perfect manner. Clark says, that in many parts of France, where the ox is much used for draught, it is sometimes necessary to employ eight shoes, one under each nail. In this country two pieces or shoes to each foot are generally made use of. They are fitted on in a similar manner to those of the horse. *An ox shoe* consists of a flat piece of iron, with five or six stamp holes on the outward edge, to receive the nails; at the toe is a projection of some inches, which passing in the cleft of the foot, is bent over the hoof, so as to keep the shoe in its proper place. As there is much trouble in the shoeing of oxen, from the necessity for casting them each time, it has been found requisite to have recourse to contrivances for shoeing them standing. *The age* at which an ox may be worked is generally from two and a half to three and a half years. *The period* which an ox is worked varies from his fifth to his tenth year. *The length of time per day* which an ox is kept in the yoke varies according to the kind of labour, and the age and keep of the ox. If an ox is fed on hay, oats, and some roots, he will plough four days a week; but if on straw and roots only, not above three days. In the former case he is worked two whole days and two half days, and in the latter case six half days. The latter is by far the best plan, for which reason, where oxen are regularly worked, two pairs should be kept for each ploughman. *The food* of horned cattle employed in labour must be substantial. It is a great mistake to suppose they can work on straw alone. Unless they have roots added to straw in winter and green food in summer; it will be an idle attempt to harness animals so nourished. The best, and indeed the only way, is to feed them well with straw, coarse hay, roots, green herbage, or pasturage, as the season and other circumstances may indicate. *The most desirable* breeds of oxen to work are the Devonshire and Herefordshire varieties, which are long legged, quick stepping animals. Lord Somerville, who has carried the working of oxen to greater perfection than any one else,

prefers the Devon breed, which most cultivators consider the quickest walkers in England. When horned cattle are only worked occasionally, whatever sort of animals are on the farm, whether bulls, cows, or oxen of good or bad breeds, will necessarily be employed. *Parkinson's father* used to make up occasionally an ox-team for the plough of four oxen and one horse as a leader, which he found did the work of two horses. There are, he says, great objections to ox-teams in the plough. He has however found them useful in some sorts of farm work, from their slow, steady pace, as in scarifying, leading dung, &c., and as the work suits them from its being easy, and having a great deal of standing: they are, says he, much more cheaply kept than horses, eat straw in the winter, and are valuable for making dung. He never saw this kind of work injure their growth. They may be worked from two to five years old without any loss of time, as they grow to that age, and are then both larger and better beef than three-years old steers. He therefore recommends ox-teams for leading dung and the other odd jobs, but not to plough and harrow. If they are worked to the age of eight or ten years, it is, he thinks, a real injury to the public, and an unprofitable practice to the farmer. *Bake-well* used to work his heifers moderately, whilst carrying their first calves; an unobjectionable practice, provided they are well fed. Bulls are generally allowed to be good labourers, and capable, if high fed, of vast exertions.

Animals which have incisive teeth, such as the horse and the ass, in both jaws, bite short grass more easily than those which want incisive teeth in the superior jaw; and if sheep and the goat bite the closest, it is because they are small, and their lips are thin. But the ox, whose lips are thick, can only bite long grass; and it is for this reason that they do no harm to the pasture on which they live, as they can only bite off the tops of the young grass; they do not stir the roots, and for this reason scarcely hurt the growth; instead of which the sheep and the goat bite so close that they destroy the stalk and spoil the root. Besides the horse chooses the most delicate grass, and leaves the largest to grow, the stalks of which are hard; instead of this the ox

bites these thick stalks, and by little and little destroys the coarse grass; so that at the end of some years the field in which the horse has lived becomes a very bad one, whilst that on which the ox has browsed becomes fine pasture. *The ox has four stomachs*, in which formation the goat, sheep, camel, and deer participate. As it is necessary that these animals should collect much herbage for their support, and as it would fatigue and keep them too long in motion to gather and masticate such a quantity at the same time, so a peculiar provision has been made for them, by which they first hastily collect their food, pass it into a reservoir, and afterwards commence the mastication of it at their leisure. *The first stomach, rumen or paunch*, is a very large membranous and muscular bag, principally occupying the left side, and extending, when full, from the middle of the ribs to the paunch, into which the unruminated food is received. It is in this stomach that the concretions called hairballs are found. It presents numerous processes to assist in the retention of food. *The second stomach*, called also *reticulum, bonnet*, or *kingshood*, would appear as a globular appendage to the paunch merely, were it not for its peculiarity of structure, which resembles the cells of the honey-comb, and which is well known to the eaters of tripe. In the hornless ruminants, the second stomach is exclusively designed as a reservoir for water, and is capable of holding and preserving a vast quantity of it. A little of this water is passed up, as wanted, to be mixed with the dry matters chewed during rumination. In the deserts of Arabia, where water is met with only at long distances, this reservoir is peculiarly advantageous to the camel and dromedary; and the Arabian travellers (when famishing for water) save themselves frequently at the expense of their camels, by killing of which, and taking out this stomach, they find a supply. *The third stomach* is named after its foliated structure, *many-plies*: there are about eighty or ninety of these septa or folds, which are covered with cuticle, in common with the two former stomachs, by which some resemblance is kept up between the digestive processes of the horse and ruminants. By the comparative insensibility of these stomachs, they can also

bear potent medicines, which would be destruction to the carnivora. By this curious extension of service the ruminated food is applied, and re-applied to the sides of the bag to be acted upon in its early stage of digestion. The *fourth stomach*, called also the *red bag abomasum, faliscus*, and *ventriculus intestinalis*, is about two feet nine inches long, in an ox, and resembles the simple digestive stomach of the mammalia. It is in this stomach that the pulaceous mass of the chyme undergoes a more perfect animalisation, by being mixed with the gastric fluid, which appears to be wholly secreted here, and thus it is that this stomach only produces rennet. The red bag, to increase its secreting surface, has likewise about nine longitudinal plicæ to each side, with an intervening rugose structure. *Rumination*, or *chewing the cud*, is the process whereby the ruminant animals, having collected their food, and having passed it into the paunch, with little or no mastication or expense of saliva, a new operation begins. The paunch being full, the animal is stimulated to seek rest and quiet, and he usually lies down. The paunch begins now to exert its extraordinary powers of separating a portion from the contained mass, and to return it into the mouth, where it undergoes a complete mastication, and mixing with the saliva. It is then again passed down the throat, but instead of again entering the first stomach, the muscular gutter forms itself into a tube, and carries it at once into the third stomach, where having to undergo a further change, it is passed into the red bag, or fourth stomach, to undergo a further solution, by means of the gastric fluid, preparatory to its being converted into nutriment under the name of chyle. In this wonderful conformation of the ox and other ruminating animals, who is not constrained to admire and adore the wisdom, and the power, and the mercy of the great Creator in the curious mechanism of these four stomachs, so wisely intended to answer their several respective purposes. *The action of ruminating, however, appears to be in a great measure voluntary*; as animals of this kind have a power of increasing the reaction of their stomachs. After the food undergoes a second mastication it is then reduced into a thin pulp, which easily passes

from the second to the third stomach, when it is still further macerated; from thence it passes to the fourth, where it is reduced to a perfect mucilage, every way prepared for being taken up by the lacteals, and converted into nourishment. What confirms this account of chewing the cud is, that so long as these animals suck, or feed upon liquid aliment, they never ruminate; and in the winter, when they are obliged to feed upon hay and other dry victuals, they ruminate more than when they feed upon fresh grass. *Bulls, cows, and oxen are fond of licking themselves*, especially when lying at rest. But this practice should be prevented as much as possible; for as the hair is an indigestible substance, it lies in the stomach, and is gradually coated; and as it is thought that it prevents their fattening, it is usual to rub all the parts of their body which they can touch with their dung. When this precaution is not taken, they raise up the hair of their coats with their tongues, which are very rough, and they swallow this hair in great quantities. As this substance cannot digest, it remains in the stomach, and forms round, smooth balls, which are sometimes of so considerable a size, that they incommode them, and prevent their digestion. These knobs in time get covered with a brown crust, which is somewhat hard; it is, notwithstanding, only a thick mucilage, which, by rubbing and coaction, becomes hard and shining; it is never found anywhere but in the paunch, and if any of the hair gets into the other stomachs, it does not remain there any more than in the bowels, but seems to pass with the aliment. *The age of this animal is known by his teeth and horns*. The first front teeth fall out when he is ten months old, and are replaced by others which are larger and not so white; at fifteen months those on each side of the middle teeth drop out, and are replaced by others; and at three years old all the incisive teeth are renewed; they are then all long, white, and even, and in proportion as the ox advances in years, they decay, and become unequal and black. The horns fall off at three years, and there are replaced by other horns, which, like the second teeth, fall off no more; only those of the ox and cow grow larger and longer than those of the

bull; the growth of these second horns is not uniform. The first year, that is to say, the fourth year of the age of the ox, two little pointed horns sprout, which are even, and terminate at the head by a kind of knob; the following year this knob grows from the head, pushed out by a cylinder of horn, which forms and terminates also by another knob, and so on; for as long as the animal lives the horns grow: these knobs become annular knobs, which are easily to be distinguished in the horns, and by which also the age may be easily known, by reckoning three years for the first knob next the point of the horn, and one year more for each of the intervals between the other knobs. The bull, cow, and ox generally live about fourteen or fifteen years. Ox beef is very nourishing, and yields a strong aliment; the flesh of a cow when well fattened and young is not much inferior. Bull-beef is hard, tough, and dry; for which reason it is not much used for food. Veal is well tasted, easy of digestion, and rather keeps the body open than otherwise. The northern countries of Europe produce the best cattle of this kind. In general they bear cold better than heat; for this reason they are not so numerous in the southern countries. There are but few in Asia to the south of America, or in Africa beyond Egypt and Barbary. America produced none of these species till they were carried by the Europeans. But the largest are to be met with in Denmark, Podolia, the Ukraine, and among the Calmuc Tartars; likewise those of England, Ireland, Holland, and Hungary, are much larger than those of Persia, Turkey, Greece, Italy, and Spain; but those of Barbary are least of all. In all mountainous countries, as Wales, the Highlands of Scotland, &c., the black cattle are small but hardy, and when fattened make excellent beef. In Lapland they are most white, and many of them want horns. The British breed of cattle, Mr. Pennant observes, has in general been so much improved by foreign mixture, that it is difficult to point out the original kind of these islands. Those which may be supposed to have been originally British are far inferior in size to those on the northern part of the European continent; the cattle of the Highlands of Scotland are exceedingly small, and

many of them, males as well as females, are hornless; the Welsh kinds are much larger; the black cattle of Cornwall are of the same size with the last. The large breeds now cultivated through most parts of Great Britain are either entirely of foreign extraction, or our own improved by a cross with the foreign kinds. There are many varieties of this species, among which the following are mentioned by Mr. Kerr and Professor Gmelin:—

Bos Taurus Madagascanensis.—The bony or Madagascar ox, is of a large size and white colour, with pendulous ears, and a hunched back. It inhabits Adel and Madagascar.

Bos Taurus Abyssinicus.—The Abyssinian ox has a hunch on its back, and the horns adhere to the skin only, and hang pendulous. It inhabits Abyssinia and other parts of Africa.—*Bos Taurus Africanus*, the lant is white, and has elegant horns, slender legs, and black hoofs. It inhabits Africa, and is swifter than most horses. The hide is said to be impenetrable by a bullet. Some reckon it a species of antelope.—*Bos Taurus Bison* has horns reflected forward, a hunched back, and a long mane. It is white, and is supposed by Buffon to be the same with the *bonassus* and *ferus*; but Gmelin ranks them as distinct. It is quite a different animal from the American bison.—*Bos Taurus ferus*, the wild ox, inhabits the marshy woods of Poland, Prussia, and Lithuania. It is supposed to be the original stock of all the European domestic breeds. It has thick short horns, reflected forward, and a curly forehead. About two hundred and fifty years ago, there was found in Scotland a wild race of cattle, which were of a pure white colour, and had, if we may believe Boethius, manes like lions. Mr. Pennant says, "he has seen in the woods of Drumlaning, in North Britain, and in the park belonging to Chillingham Castle, in Northumberland, breeds of cattle probably derived from the savage breed. The former appears to have been exterminated by the late Duke of Queensbury. They had lost their manes, but retained their colour and fierceness; were of a middle size, long legged, and had black muzzles and ears; their horns fine, with a bold and elegant bend. They were as wild as any deer; on being approached, they

would instantly take to flight and gallop away at full speed; never mix with the tame species, nor come near the house, unless constrained to it by hunger in very severe weather. Frequent mention is made of our savage cattle by historians. One relates that King Robert Bruce was (in chasing one of the animals) preserved from the rage of a wild bull by the intrepidity of one of his courtiers, from which he and his lineage acquired the name of *Turnbull*. Fitz-Stephen names these animals *ursi sylvestres*, among those that harboured in the great forests that in his time lay adjacent to London. Another enumerates, among the provisions at the great feast of Nevil, Archbishop of York, six wild bulls; and Sibbald, assures us, that in his days a wild and white species was found in the mountains of Scotland, but agreeing in form with the common sort. These were probably the same with the *bisontes jubati* of Pliny, found then in Germany, and might have been common to the Continent and our island; the loss of their savage vigour by confinement, might occasion some change in the external appearance, as is frequent with wild animals deprived of liberty, and to that we may ascribe their loss of mane. *The urus of the Hyrcanian forest*, described by Cæsar, was of this kind; the same which is called by the modern Germans, *auerochs* (i. e.) *Bos sylvestris*. Those kept at *Chillingham Castle*, in *Northumberland*, a seat belonging to the Earl of Tankerville, are invariably of a creamy white, muzzle black; the whole of the inside of the ear, and about one-third of the outside, from the tips downwards, red; horns white, with black tips, very fine, and bent upwards; some of the bulls have a thin upright mane, about an inch and a half or two inches long. The weight of the oxen is from thirty-five to forty-five stone, and the cows from twenty-five to thirty-five stone the four quarters (fourteen pounds to the stone). The beef is finely marbled, and of excellent flavour. From the nature of their posture, and the frequent agitation they are put into by the curiosity of strangers, it is scarcely to be expected they should get very fat; yet the six years old oxen are generally very good beef, from which it may be fairly supposed that, in proper situa-

tions, they would feed well. *The habits* of these animals are entirely rude; on the first appearance of any person near them they set off in full gallop; and, at the distance of two or three hundred yards, make a wheel round, and come boldly up again, tossing their heads in a menacing manner. On a sudden they make a full stop, at the distance of forty or fifty yards, looking wildly at the object of their surprize; but, upon the least motion being made, they all again turn round and fly off with equal speed, but not to the same distance, forming a shorter circle, and again returning with a bolder and more threatening aspect than before, they approach much nearer, probably within thirty yards, when they again make another stand, and again fly off: this they do several times, shortening their distance, and advancing nearer and nearer till they come within ten yards, when most people think it prudent to leave them, not choosing to provoke them farther, as, in a few turns more, they would make an attack.

When the cows calve, they hide their young ones for a week or ten days in some sequestered situation, and go to suckle them two or three times a day. If any person comes near them, the calves clap their heads close to the ground, and lie like hares in form, to hide themselves. This seems a proof of their native wildness, and is corroborated by the following circumstance that happened to Dr. Fuller, author of the *History of Norwich*, who found a hidden calf two days old, very lean and very weak; on his stroking its head it got up, pawed two or three times like an old bull, bellowed very loud, stepped back a few steps, and bolted at his legs with all its force; it then began to paw again, bellowed, stepped back, and bolted as before, but knowing its intention, and stepping aside, it missed him, fell, and was so very weak that it could not rise, though it made several efforts: but it had done enough; the whole herd were alarmed, and, coming to its rescue, obliged him to retire; for the dams will allow no person to touch their calves without attacking him with impetuous ferocity. When a calf is to be castrated, the park-keeper marks the place where it is hid, and when the herd are at a distance, takes an assistance with him on horseback;

they tie a handkerchief round the calf's mouth to prevent its bellowing, and perform the operation in the usual way, with as much expedition as possible.

When any one of these animals happens to be wounded, or is grown weak and feeble through age or sickness, the rest of the herd set upon it and gore it to death. *The mode of killing them*, as it was practised a few years ago, was, perhaps, the only remains of the grandeur of ancient hunting. On notice being given that a wild bull would be killed on a certain day, the inhabitants of the neighbourhood came mounted and armed with guns, &c. sometimes to the amount of a hundred horse, and four or five hundred foot, who stood upon walls or got into trees, while the horsemen rode off the bull from the rest of the herd, until he stood at bay, when a marksman dismounted and fired. At some of these huntings, twenty or thirty shots have been fired before the animal was subdued. On such occasions, the bleeding victim grew desperately furious from the smarting of his wounds, and the shouts of savage joy that were echoing from every side. But, from the number of accidents which happened, this dangerous mode has been little practised of late years, the park-keeper now generally kills them with a rifle gun at one shot. *The varieties of the European cow*, according to Aiton, are innumerable. The pliancy of their nature is such that they have been formed into many diversities of shape and various qualities have been given them, very different from the original stock. The *uris* or cows of Lithuania, are almost as large as the elephant, while some of these on the Grampian Hills are little above the size of a goat; and cows are found of every diversity of size between the one and the other. They are no less varied in their shapes. The *bison* which is a species of the cow family, and which readily propagates with our cows, wears a strong shaggy mane like the lion; a beard like the goat; as much hair under its neck and breast as covers its fore legs; a hump upon its shoulders, nearly as large as that worn by the camel, and sometimes forty, fifty, or sixty pounds in weight, with a tail that scarcely reaches the top of its buttock, and it resembles the lion much more

than it does our domesticated cows, or other varieties of its own species. *The diversity of qualities in the cow family* is also very great. Our cows are so gravelling and inactive, that they scarcely know the road from their own stall to their pasture; while those of the Hottentots are so tractable, as to be entrusted with the charge of other animals, and keep them from trespassing on the fields of grain or other forbidden ground. They also fight their masters battles, and gore his enemies with their horns. Our dairy cows are so feeble and inactive that they are hurt by travelling twice a day, even slowly, one mile from the barn to their pasture, while those of Tartary are used as riding animals, and in drawing carriages; those of Hindoostan draw the coaches, and maintain their pace with horses at the full trot, and the Hottentots teach their cows to hunt down the elk antelope. Cows of the wild neglected breed can with difficulty be removed from one enclosure, or one hill to another; while those on whom due attention has been bestowed, are docile, and submit to perform all sorts of labour. Some cows will yield upwards of twenty Scots pints of milk daily, whilst others will not give so much in ten, perhaps in twenty days. There are not so many different species of animals, but all of them one and the same species, all capable of generating with each other a perfect offspring. All these varieties have been formed from the parent stock, partly by the diversity of soil and climate, or other accidental or adventitious circumstances, and partly of late by human skill and industry.

In this country neat cattle or oxen and cows are divided into two kinds, the long horned or Lancashire breed, and the short horned or Dutch breed, known by a variety of names; as the *Holderness*, the *Teeswater*, the *Yorkshire*, *Durham*, *Northumberland*, and other breeds. The *long horned* breed is distinguished from the others, by the length of their horns; the thickness, firmness, and texture of their hides, their long and close hair, large hoofs, and coarse leathery thick necks; their fore-quarters are deeper, and hind-quarters lighter than those of most other breeds. They are said to give less milk than the short horns, but that the milk affords more cream in proportion, and their beef being finer

grained, and more mixed and marbled. They are more varied in their colour than other breeds. There has, however, been but little improvement in this breed, notwithstanding the singular efforts that have been made towards their improvement. *The short horned* sometimes called the Dutch breed is known by a variety of names, taken from the districts where they form the principal cattle stock, or where most attention has been paid to their improvement. *The Holderness, Teeswater, Yorkshire, Durham, and Northumberland*, are the principal of the *short horned* breeds. *The Teeswater* variety is at present in the highest estimation, and is alleged to be the true Yorkshire short horned breed. Bulls and cows from this stock purchased at most extraordinary prices are spread over all the north of England, and the border counties of Scotland. These oxen commonly weigh from sixty to one hundred stone, of fourteen pounds, and they have several times been fed to one hundred and twenty, one hundred and thirty and in some cases to one hundred and fifty stone; the four quarters only. One cow commonly yields twenty-four quarts of milk daily, making three firkins of butter during the grass season. Their colour is various but commonly red and white mixed. The East India ships are victualled by the carcasses of these oxen, as they produce the thickest beef, which by retaining its juices, is the best adapted for such long voyages, and the Royal Navy ought to be; but this is not always, it is to be feared, the case. There is, however, another kind called the *middle breed* comprehending several local varieties, such as the *Devons*, the *Sussex*, and the *Herefords*. These are reckoned the best for the draught on account of their activity and hardiness; but the cows do not yield so much milk as the short horns, although they may be fattened at an early age when not employed in labour. *The Devonshire cattle* are of a high red colour. The weight of the cows from thirty to forty stone, and of the oxen from forty to sixty. The north Devon variety, from the fineness in the grain of the meat, is held in high estimation in Smithfield. *The Sussex and Herefordshire cattle*, are of a deep red colour, with fine hair, thin hides, and in general well made, but their bone is not large. A fat ox, six years

old, will way from sixty to one hundred stone. They are worked from three to six years old, and then turned off for feeding. *The polled or hornless breed* is black and dark brindled, although they are sometimes found of every colour. It is said that the dark coloured are hardier in their constitutions. They are not so large in size as the *Devons*. At three years and a half old they weigh about forty stone, avoirdupois; and some of them fattened in England have been brought to nearly one hundred stone. The most numerous and esteemed variety is the *Galloway* breed, so called from the province of that name in the south west of Scotland, where they most abound. *The cattle of the Highlands of Scotland* are divided into a number of local varieties, some of which differ materially from others. *The most valuable* of these are the cattle of the western Highlands commonly called the *Argyleshire* breed, or the breed of the Isle of Skye, one of the Islands attached to the county of Argyle. The cattle of the *Hebrides* are called *Kyloes*. The cattle of *Orkney and Zetland* are of a most diminutive size, an ox weighing about sixty pounds a quarter. They are of all colours, and their shapes are generally bad; yet, they give a quantity of most excellent milk: fatten rapidly, and in their own district are considered strong, hardy, and excellent workers. *Of the Fifeshire cattle*, Culley observes, "you would at first sight imagine them a distinct breed. *The prevailing colour* is black; the horns are small, white, and generally pretty erect. They fatten quickly, and fill up well at all the choice points: are hardy, fleet, and travel well, and are excellent for labour, both at plough and cart. A good cow of this breed gives from eighteen, to twenty-four quarts of milk per day, yielding from seven to nine pounds of butter, and from ten to twelve pounds of cheese per week (twenty-four ounces to the pound), for some months after calving." *The cattle of Aberdeenshire*, the largest of which are said to have been produced by crossing with Fife bulls, have been long esteemed in the southern markets. It is observed, that every succeeding generation of them has increased in size for the last thirty years, and that the native breed has doubled its former weight since the introduction of turnips. *Of the Welsh cattle* there seems to be

two distinct kinds. The *large* sort are of a brown colour, with some white on the rump and shoulders, denoting a cross from the the long horns, though in shape not the least resembling them; they are light in flesh and next to the Devons, well formed for the yoke: have very good hoofs, and walk light and nimble. The *other* sort is much more valuable, colour black, with very little white; of a good useful form, short in the leg, with round deep bodies, the hide is rather thin, with short hair, they have a lively look, and a good eye, and the bones though not very small, are neither large nor clumsy. *The objects to be kept in view in breeding cattle* are, forms well adapted for fattening, for producing milk, or for labour. These three objects have each of them engaged the attention of British Agriculturists, but experience has not hitherto justified the expectation that has been entertained of combining all these desirable properties, in an eminent degree, in the same race. That form which indicates the property of yielding the most milk, differs materially from that which we know from experience to be combined with early maturity and the most valuable carcass; indeed a *disposition to fatten and a tenderness to yield a large quantity of milk*, cannot be united. The form of the animal most remarkable for the first, is very different from that of the other; in place of being flat in the sides, and big in the belly, as all great milkers are, it is high sided and light bellied; in a word, the body of the animal well adapted to fatten is barrel formed, while that of the milker is widest downwards. *An extraordinary degree of attention* has been paid to the breeding of cattle in England since the time of Bakewell. The extraordinary prices paid for the best bred bulls and cows, show that this attention has not been without its reward. *In order to have good cattle of any breed*, particular regard must be paid in selecting those that are the most complete and perfect in their form, shape, and other qualities, and to breed from them. *The fattening of cattle demands considerable and constant attention*, and the grand object is to fatten quickly. An animal when in a state of rearing may be considered as a vessel open at both ends, in which the supply and the waste being nearly equal, it can never be

filled: fattening an animal may be considered as an attempt to fill the vessel, and this can only be done by excess of supply. The waste being the same as before, this excess must be great, if it is not so, the vessel may be filled to a greater height than before, but without ever becoming full. An important hint might be taken from this simile, by many farmers who know little of the difference between feeding and fattening. We have known cattle, sheep, and swine kept for months, and fed with a view of fattening them without their gaining a pound of meat. *The food upon which cattle is fatted in summer*, is grass, commonly on pastures, but in a few instances, cut and consumed in feeding-houses or fold-yards: in winter by far the greater number are fatted on turnips, carrots, potatoes, &c., and in particular districts, oil-cake, chiefly for feeding the large animals; but few comparatively, are fatted on any of these without the addition of turnips, of one or other of the varieties generally cultivated. A considerable number of cattle are also fatted on the offals of distilleries when distilling from corn. *The age at which cattle are fatted*, depends upon the manner in which they have been reared the properties of the breed; in regard to a propensity to fatten earlier or later, in life; and on the circumstances of their being employed in labour, for the dairy or reared solely for the butcher. In the latter case the most improved breeds are fit for the shambles when about three years old, and very few of any large breed are kept more than a year longer. Stall-feeding is the most common, and when judiciously conducted probably be most eligible method, in regard to the cattle themselves, the economy of food, and the expense of farm-buildings.—*Booth's establishment for fattening cattle at Brentford*, is by far the most extensive in the neighbourhood of London. It was formed for the purpose of consuming on the spot the grains and wash of the extensive distillery of that family. The building is two hundred and ten feet long, and one hundred and eighty feet wide, and calculated to contain six hundred heads of cattle. It cost eight thousand pounds. The immense quantity of wash produced by the distillery is kept in a cistern or tank above the level of the mangers, and in a different part of the premises;

but pipes from this tank are conducted under the surface and communicate with each of them, so that by turning a cock the whole of the cattle in any of the ranges are instantly supplied with wash. This article serves both as food and drink, as it contains the finer particle of of the ground malt, and the greater part of the barley-meal used in the mashing process. Little or no litter is used, and neither green food nor hay uncut is ever given, it being found that rough clover chaff mixed with the grains and wash will fatten to any extent.

Cattle are subject to dangerous diseases, some of which we shall briefly specify. *Mild fever*, *pantag*, or *pantasia*. Cattle sometimes appear affected with heat, redness of the nostrils and eyelids; they refuse food, are dull, and the urine is high coloured. These symptoms are often aggravated every other day. Bleed and give half an ounce of nitre in a drink night and morning. *Inflammatory fever* is called by farriers, *cow-leeches*, and graziers by the various names of black quarter, joint felon, quarter evil, quarter ill, showing of blood, joint murrain, striking in of the blood, &c. It is sometimes epidemic, at other times, caused by a sudden change from a scanty to an abundant diet. No age is exempt from it, but the young oftener have it than the mature. The symptoms are a dull and heavy countenance, red eye and eyelids, and nostrils, from which a slight mucus flows. The pulse is very quick, the animal irritable, and the appetite entirely lost. At the commencement of the disease, bleed liberally, purge also, and give a fever drink. This treatment is only suitable in the *first* stage of the disease. Afterwards, instead of bleeding and purging, inject clysters of warm water and salt to clear the bowels. Four drachms of muriatic acid, in three pints of decoction of oak-bark, given twice a day, has proved useful. *Catarrh*, or *influenza* in cattle, known also by the name of *felon*, is only a milder form of the next disease. Even in this mild form, it is sometimes epidemic or prevalent among numbers. The treatment is the same as for the next disorder. *The malignant epidemic influenza* is popularly called the *murrain*, or *pest*, and has, at various times, made terrible havoc among cattle. In 1757, it visited Britain, pro-

ducing extreme fatality among our kine. From 1710 to 1714, it continued to rage on the Continent with unabated fury. The years 1730 and 1731, and from 1744 to 1746, its attacks and effects were severely felt. *Symptoms of the murrain* are a difficulty of swallowing, itching of the ears, shaking of the head, excessive weakness, staggering gait, and a continual desire to lie down. A sanious foetid discharge from the nostrils and eyes, cough, fever, and quickened pulse. The forces, urine, and breath, all become foetid, and whatever was discharged from the cattle tainted every thing around. *The treatment of the murrain*.—In the very early stages bleeding. During the two first days of the attack, bleeding may be used with those cattle whose previous health and good living will enable them to bear it. In the early stages, saline purgatives may be adopted, from ten to twenty ounces of epsom salts are to be invariably used. Setons in the dewlaps are recommended. When abscesses appear, open them, wash the wound with brandy or vinegar, if putrid, sloughing takes place. The other essentials of medical treatment are the same as those for malignant epidemic among horses. *The mode of rearing calves* is various. In *Yorkshire*, and most parts of *Scotland*, the usual method is to give them milk to drink, there being few instances where they are allowed to suck. In *Cheshire*, the practice is to allow the calves to suck for the first three weeks. This seems to be the most natural, and best method that can be adopted. In *Gloucestershire*, the calves are not allowed to suck above two or three days, they are then fed on skim milk, which has been previously heated over the fire. In *Sussex*, it is common to allow the calves to suck for ten or twelve weeks, or to wean them at the end of three or four, and give them a liberal allowance of skim milk for eight weeks longer. In *Middlesex*, it is usual, in rearing calves, to give them a pailful, containing about a gallon of milk, warm from the cow, morning and evening, for eight or ten weeks, or to allow the calf to suck its dam. In summer, calves may sometimes be reared on whey only; but, when reared in winter, they must be fed with hay, and clover-hay is probably the best of any for this use. Calves may also be raised with por-

ridge of different kinds without any mixture of milk. *The best time for rearing calves is the spring; but that operation must depend in some degree on the time when the calf was dropped.* Such as are weaned during autumn or winter, however, seldom do any good. *The treatment of young cattle, from the time they are separated from their dams, or are able to subsist on the common food of the other stock, must entirely depend upon the circumstances of the farm on which they are reared.* *The most advantageous stock for suckling calves for the butcher is that sort of cow which gives the greatest quantity of milk, richness of quality being not so great an object, or so well adapted for fattening as quantity.* *The Holderness and Devon cows appear to be the best adapted for giving abundance of milk.* *The only advantage which suckling can have over giving calves milk to drink, is that the action of sucking induces a greater secretion of saliva, which by promoting digestion, accelerates the growth and fattening of the young animal.* *When calves are intended for the butcher, it is usual to allow them to suck, as the object by this means is sooner and more effectually obtained than by any other means.* *The time necessary for fattening calves in this way, must be different, according to circumstances. From seven to nine weeks is the period generally allowed.* *When young, they must not be permitted to suck their fill, as this often relaxes them.* *When three weeks old, they may suck as much as they please, and chalk and salt be given to them to increase their appetite, and to impart to their flesh a delicate whiteness.* *Calves suckled on their own dams will generally fatten in a shorter time than those brought in to supply their place.* *The milk of the dam is more nutritious for the calf than that of a stranger.* *Calves of the largest size are fattened in Essex, where the business of suckling seems to be better understood, and more properly conducted than in any other county.* *The calves in Essex are kept to a greater age than in other counties, and great numbers of them are sent to the London markets.*

For the dairy and its management, see *Cottage Economy*.

In conclusion, we may remark, of the *Bos* family, that, notwithstanding their

massy forms, these animals can run with very considerable quickness, and notwithstanding their apparent phlegm and stupidity, they frequently exhibit proofs of no ordinary sagacity; nor are they unsusceptible of attachment, for they readily recognize their homes, and the persons who treat them with attention and kindness. They seem likewise to be conscious of impending changes of weather. If abroad, for example, when after long continued drought, the sky is thickening, and rain approaching, we may frequently observe the cattle stretching their necks, and snuffing in the air with distended nostrils; or before storms, assembling in the corner of the field, with their heads to the leeward. There is every reason to believe that the common cow is not insensible to the variety of distinction and preference. The fine cattle, which are the pride of the *senn*, or the cowkeeper, in certain districts of the Swiss Alps—as for example, the Canton of Appenzel—are adorned with large bells, suspended from broad thongs, and every *senn* has an harmonious set, of at least two or three bells, which are worn only on certain gala or procession days. The *senn*, arrayed in his best garb, leads the van, singing the *ranz des vaches*; three or four goats follow; then comes the handsomest cow with the greatest bells; and then the others with smaller bells. These are succeeded by the rest of the herd; the bull with a milking stool hanging on his horns, and a sledge containing the implements of the dairy, bringing up the rear. The cows themselves, no less than their conductors, seem to be pleased with their ornaments, and if the leader is deprived of her honours, she manifests her vexation by incessant lowing, abstains from food, and pursues her rival with vengeance who has obtained the badge of superiority, assaulting and wounding her in the most furious manner. These animals, when dispersed in the Alps, are brought together by the voice of the *senn*, singing the *ranz des vaches*. Although the best food for cattle is good pasturage in the open air, yet, in consequence of their being housed, and subjected to labour, a mixture of harder and more substantial aliment occasionally becomes requisite. Water which is agitated and beaten is to be preferred for their drink

to that which is stagnant; that of rivers to spring waters; that of pools to water in marshes; and this last is sometimes less hurtful than well water, if the latter is incapable of boiling vegetables. If, however, none but the worst water can be procured, it ought to be previously filtered through sand, and even rendered still more wholesome by mixing with it a little bran or barley-meal. In the heat of summer, especially if the water be not of a good quality, it will be proper to allow a wine-glassful of vinegar to every pailful of water; and in case of inflammatory disorders, which have a tendency to induce gangrene, it is recommended to mix vinegar in the proportion of one-sixth of the whole quantity of drink, whether that be water or whey. At all events, cattle should be allowed water twice a-day, especially when they are fed on dry provender; for negligence in this respect is often the cause of serious maladies. Cattle, like sheep, are extremely fond of salt, and of herbage over which the sea has flowed, repairing steadily to the beach, when it is in their power during the ebb tide, and retiring again when the tide flows. In some parts of Norway, and other poor countries washed by the sea, the cows are often fed principally on salt-fish or sub-marine plants.

ON SHEEP.

Ovis, the sheep; in zoology, a genus of the Class and Order *Mammalia Perceve*.

The generic character, is — *Horns hollow, wrinkled, turned backwards and outwards into a circular or spiral form. It has eight lower fore teeth, and is without canine teeth.*

The animals of this genus are gentle, harmless, and useful; they supply food and raiment, and prefer open plains; they are not very active, and fight by butting each other with the head reclined; they threaten by stamping the ground with their feet, and they drink but little. The wool is only a congeries of very long and slender hairs twisted and contorted, and variously interwoven with one another. This, as far as is yet known, is a clothing peculiar to the sheep kind, no other animal having been seen to possess it. According to the Linnæan system, there are four species; but Dr. Shaw includes the whole

genus in three species, making the *Strepsiceros*, or Cretan sheep, a mere variety of *Ovis aries*.

1. *Ovis AMMON* (the argali, or wild sheep). *Horns arched, semi-circular, wrinkled above, flattish beneath; declaps hairy, loose.*

As the *Capra ægagrus*, or Caucasian ibex, is supposed to be the original of the domestic goat, so the *Ovis Ammon*, argali, or musimon, is believed to be the chief primæval stock from which all kinds of domestic sheep have proceeded; and on that account we have followed Dr. Shaw, in placing that species first, though Linnæus begins with the common sheep. The *argali*, which in the Siberian language means "wild sheep," is called by the Russians *kamenoi baran*, or "sheep of the rocks," from its ordinary place of abode. According to Pallas, it is the same with the *musimon* of Pliny, and the *ophion* of the Greeks. It is found in all its native wildness, vigour, and activity, inhabiting the vast chain of mountains which run through the centre of Asia to the Eastern Sea, and the various branches of this chain extending through Great Tartary, China, the north of Hindoostan, and Persia, on the highest mountains of Barbary, and in Corsica. The argali delights to bask in the sun on the bare rocks, but avoids the woods and the shade; it feeds on alpine plants and shrubs, prefers a temperate climate, but is also found amongst the rocks of Asiatic Siberia. This animal loves a state of solitude, and flees the haunts of men. According to professor Pallas, nothing but the surrounding sea can account for the argali being found on an inhabited island, as is sometimes the case. But it is said that these animals also inhabit California. The Jesuits who visited that country in 1697, say, that they found a species of sheep as big as a calf, of a year or two old, with a head like that of a stag. This is very likely, as the migration from Kamschatka to America is far from being difficult. They were once inhabitants of the British Isles. Boethius mentions a species of sheep in St. Kilda, larger than the largest he-goat, with the tail hanging to the ground, and horns longer and as thick as those of an ox. "This account," says Mr. Pennant, "like the rest of his history, is a mixture of truth and fable. I find

the figure of this animal on a Roman sculpture taken out of Antonius's Wall, near Glasgow. It accompanies a recumbent female figure, with a *rota* or wheel expressive of a *via*, or way, cut possibly into Caledonia, where these animals might in that early age have been found. Whether they were the objects of warship, as among the ancient Tartars, I will not pretend to say; for among the graves of those distant Asiatics, brazen images, and stone figures of their *argali*, or wild sheep, are frequently found."

The *argali* is about the size of the fallow-deer, but its make is more robust, being less elegant than the deer, and its neck and legs are shorter. Its head resembles that of a ram, with long straggling hairs about the mouth, but no beard like the goat. The colour is a grayish ferruginous brown above and whitish beneath, the face is also whitish, and behind each shoulder is often observed a dusky spot or patch; the legs, at least in the European kind, are commonly white. The body is large, the limbs slender but strong, tail very short, being hardly more than three inches in length; the horns in the full grown, or old animals, are extremely large, placed on the top of the head, and stand close at their base, rising first upwards, and then bending down, and twisting outwards, as in the common ram. The body is covered with hair instead of wool; in which particular consists its chief difference from the general aspect of a sheep, but in winter the face, and particularly the part about the tip of the nose, becomes more white, the back of a more ferruginous cast, and the hair, which in summer is close, like that of a deer, becomes somewhat rough, wiry, and a little curled; consisting of a kind of wool intermixed with hair, and concealing at its roots a fine white woolly down: the hair about the neck and shoulders, as well as under the throat, is considerably longer than on other parts. The female is inferior in size to the male, and has smaller and less curved horns.

In Siberia the *argali* is chiefly seen on the tops of the highest mountains, exposed to the sun and free from woods. These animals generally go in small flocks; they produce their young in the middle of March, and have one and sometimes two at a birth. The young

when first born are covered with a soft gray curling fleece, which gradually changes into hair, towards the end of summer. From spring to autumn the *argali*'s feed in the little valleys among the upper region of the mountains, on the young shoots of the alpine plants, and are said to grow very fat. As winter approaches they descend lower, and eat grass and other vegetables. They are fond of frequenting spots of a saline nature, and will excavate the ground in such places to get at the salt. The horns of the old males grow to a vast size, and have been found of the length of two Russian yards, measured along the spines, weighing fifteen pounds each. We are assured by Father Rubruquis, a traveller in the thirteenth century, that he had seen some of the horns larger than could be lifted with one hand, and of which the Tartars made great drinking cups. A more modern traveller has asserted that young foxes occasionally shelter themselves in such as are here and there found in the deserts.

The *argali* is a very timid animal, and when closely pursued, does not run in a directly progressive course, but obliquely from side to side, in the manner of other sheep, ascending the rocky mountains with great agility, and like the wild goat, going over the narrowest and most dangerous passes with perfect safety. The males are said to fight frequently among themselves, and will sometimes precipitate each other down the rocks in their contests. To chase them is dangerous and difficult, but an important object with some of the Asiatics, as the animal furnishes a great number of necessary articles. Pallas informs us, that the flesh of the lamb is excellent, that of the old animals good, but more particularly when roasted. The *argali* abound in Kamtschatka, where they supply the inhabitants both with food and clothing. Their flesh, and particularly their fat, are esteemed by the Kamtschadales as diet fit for the gods; and there is no labour which these people will not undergo in the chase of these animals. Whole families abandon their habitations in the spring of the year, and occupy the entire summer in this employment, amidst the steepest and most rocky mountains, fearless of the dreadful precipices which often overwhelm the eager sportsman.

These animals are shot with guns or with arrows; sometimes with cross-bows placed in their paths. They are sometimes chased by dogs, but their fleetness leaves them far in the rear. The purpose, however, is answered: they are driven to the heights, where they often stand and view, as it were, with contempt, the dogs below; while their attention is thus occupied, the hunter creeps cautiously within reach, and brings them down with his gun. In some of the other northern countries the Mongols and Tungusi attack them in a different manner; a great number of horses and dogs are collected together, and a sudden attempt is made to surround them. But great caution is requisite; for if the animals, either by sight or smell, perceive the approach of their enemies, they instantly escape, and secure themselves among the inaccessible summits of the mountains. From the above description, it will sufficiently appear that the wild sheep is by no means that seemingly helpless animal which we view in a state of confinement and artificial life, but in the highest degree active and vigorous.

In Corsica the argali is known by the name *mufro*, where it is so wild as to be rarely taken alive, but is shot by the hunters, who lie in wait for it among the mountains. When the young are taken, however (which is sometimes the case when the parent is shot), they are observed to be very readily tamed. The Corsican argali, or moufflon of Buffon, is of a darker colour than the Asiatic kind.

The celebrated Buffon has enlarged with equal elegance and inaccuracy on the history of the common sheep, and has ventured to advance one opinion at least which proves the fallacy of theoretical observations in a striking point of view: after considering the weakness and stupidity of this animal in a domesticated state, reflecting that he is without defence, that he has for his enemies all devouring animals, and can alone find safety in flight, he is tempted to think, that from the beginning it was a creature confided to the care of man; that it was dependent upon his help, and could not have continued to subsist without it; and of this he is persuaded, because wild sheep were never found in the desert.

The history of the argali, considered

as the parent of these creatures, proves this to be at best a *visionary* idea; and those who have seen the sheep of the domesticated kinds that are permitted to rove amongst the mountains, well know with what address these creatures guard to the best of their means against every enemy, and will not therefore give implicit credit to the rest of his observations. The argalis have a far wider range, and are perfectly in a state of nature; they are endowed with greater strength and activity, and their mode of life proves them to be neither that helpless or defenceless race we might be led to imagine; they *contribute* to the comfort, but *can* live independently of the fostering protection of man.

From the facility with which the young of the argali is domesticated, and from the character of this animal, as well as its situation, we may with much probability infer that it was the parent of the Asiatic flocks. According to travellers, the coat of the argali is of a gray or nut brown colour; probably it may be of different colours in the different districts it inhabits. In early ages the fleeces of domestic sheep appear to have been all of a dark colour: such was the flock of Laban in Mesopotamia, and the narrative of the manner in which the change was effected may serve to show, that, previously to that time, the common colour of the sheep was black or dark brown. The improvement in the quality, as well as the colour of the fleece, has always been closely connected with the progress of the arts; for we uniformly find in countries where these have flourished, a race of sheep which yield wool of a superior quality to those around them. In Persia and Syria, the influence of ancient manufactures is still visible in the superiority of their sheep, as fine-woolled animals. From Asia Minor these animals were transported into Greece, and from thence into Italy and Sicily. They were dispersed by the Romans over various parts of Europe, and the Tarentine sheep, formerly celebrated for their fine soft wool, were introduced into Spain, where they have flourished for sixteen centuries; the present Merino race being their immediate descendants, but rendered more hardy by an intermixture with the original native sheep of Spain. The circumstances re-

specting the management of the Tarentine flocks, recorded by ancient writers, when compared with the present treatment of the Merino flocks in Spain, leave no doubt respecting the origin of the latter.

The term Merino, in the Spanish language is an adjective derived from the corrupt Latin *merinus* or *majirinus* when united with *ovejás*, it signifies the royal judge, or superintendent of the sheep-walk. At the period when the *trashumantes*, or travelling flocks in Spain, were established they became the object of police, and were placed under the exclusive jurisdiction of mayors with public walks and large districts allotted for their sustenance and were termed *merinos ajevas*, or the sheep under the care of the merino or mayor. The names peculiar to the establishment of these flocks, such as *mesta*, *cavana*, &c., are derived not from the Morisco, but from the provincial Latin that prevailed in Spain, before and after it was subdued by the Goths. The management of the flocks is peculiarly Roman, the merino or mayor, corresponds exactly with the *magisterpecoris* of Varro and Collumela, and was superior to the *opiliones* and *pastures*. The practice of destroying half of the sheep at their birth, and of suckling each of the survivors on two ewes, of sweating the sheep before they were shorn, to increase the softness of the fleece, and of conducting them from their winter to their summer stations, by long journies, through public sheep-walks, has been derived from the Roman institutions, with this difference, that in Italy, their migrations were confined to the coarse-woolled sheep, while the *molles oves*, or fine-woolled flocks of antiquity were always housed.

We are thus enabled from history to trace the introduction and establishment of the Merino race of sheep in Spain, from which, or from their descendants, nearly all the manufactures of fine woollen cloth in Europe are at present supplied with wool. The destruction or deterioration of the improved flocks in the ages of barbarism which succeeded the fall of the Roman Empire, was the natural consequence of the decay of the manufactures, and of a total inattention to prevent the intermixture with coarse breeds. In Spain alone, the improved race had taken such complete possession of the mountainous districts, that it

remained unmixed and unimpaired till the revival of commerce and the arts, when that country supplied the neighbouring nations with fine wool, and was supposed to possess some superior advantages of soil and climate, which it would be in vain to seek for elsewhere. The opinion that the superior fineness of the Spanish fleeces was entirely derived from some peculiarity of the soil and climate, had obtained so generally, and was so firmly believed even twenty-five years since, that he who asserted the contrary, was regarded by agriculturists and clothiers as a speculative theorist, only deserving their pity.

It is not a little remarkable, that this prejudice continued undiminished nearly a century after the Merino sheep had been introduced into Sweden and Saxony, and had continued to produce wool in those countries, equally fine with that of their present flocks in the Spanish peninsula.

The Merino race has since been introduced into Denmark, the Prussian states, Austria, France, Holland, Italy, the Cape of Good Hope, the United States of America, England, and New Holland. It is to be observed, that the wool dealers and manufactures in France, were at first disposed to depreciate the value of the wool; but numerous accurate experiments having proved that the cloths manufactured from it were in every respect equal to those made from the best Spanish wool, these prejudices disappeared, and the republican government, as well as that of the emperor Napoleon, interested themselves in the further introduction of Spanish sheep into France. In the year 1802, it was calculated that there were 1,000,000 of pure Merinos in that country. Since that period many large flocks have been imported from Spain, the temporary command which the French obtained of that country, having afforded them facilities for their introduction.

The experiments which have been made by the introduction of the Merino sheep into the United States of America, the Cape of Good Hope, and New Holland, prove that fine wool may be grown wherever there are intelligent cultivators, and that it is not the gift of a peculiar soil or climate.

OVIS TRAGELAPHUS (the bearded sheep). This is probably a variety of the preceding, differing only in the length of the

hair on the breast, and in having a beard. Mr. Pennant in his *Synopsis of Quadrupeds*, refers it to the genus *Capra*, and thus describes these sheep. They are "sheep with the hair on the lower parts of the cheeks and upper jaws extremely long, forming a divided or double beard, with hairs on the sides and body short; on the top of the neck longer and a little erect. The whole under part of the neck and shoulders covered with coarse hairs, not less than fourteen inches long. Beneath the hairs, on every part, was a short genuine wool, the rudiments of a fleecy clothing, the colour of the breast, neck, back, and sides, a pale ferruginous. Tail very short, horns close at their base, recurvated, twenty-five inches long, eleven in circumference in the thickest place, diverging and bending outwards; their points being nineteen inches distant from each other." Dr. Kay, or Caius, gives a good description of this animal from a specimen brought into England from Barbary, in the year, 1561. He says that it inhabited the mountainous and rocky parts of Mauritania, and seemed in confinement to be very gentle, full of play and frolicsome, like a goat, the horns were like those of a ram. This appears to be the *tragelaphus* of Pliny, not only on account of its beard, and the great length of hair on its shoulders, but likewise of the place where that Roman naturalist says it was found, near the river Phasis; for Pallas says, that an animal with a divided beard, probably the same, has lately been discovered by professor Guildenstaedt on the mountains of Caucasus; from whose foot arises the very river, on the banks of which were its ancient haunts. This is by Dr. Turton, marked as a variety (12), of the common sheep. His variety (13), which he calls the *morvant* belongs to this species also, being another bearded variety of it; "beard long, not from the cheeks but on the fore-part of the breast, a short mane on the neck."

2. *Ovis Pudu* (the Chili sheep), *horns smooth, round, divergent, tail none*. This is a newly discovered species having been first described by Molina in his *Natural History of Chili*. He informs us that it is a native of the Andes of a brown colour; about the size of a kid half-a-year old, with very much the appearance of a goat, but with small smooth horns, bending outwards, and

without any appearance of beard. It is of a gregarious nature, and when the snow falls on the upper parts of the mountains, descends into the valley in large flocks to feed in the plains of Chili, at which time it is easily taken, and when taken, of whatever age, it is not difficult to domesticate them. The female is without horns.

3. *Ovis STREPSICEROS* (the Cretan sheep). *Horns upright, carinated, spirally contorted*. This species is principally found in the island of Crete, and is kept in several parts of Europe, for the singularity of its appearance; the horns being very large, long, and twisted in the manner of a screw. Those of the male are upright, and those of the female at right angles to the head.

4. *Ovis ARIES* (the common sheep). *Horns compressed and lunate*. Of all the animals with which Divine Providence has stored the world for the use of man, none is to be found more innocent, more useful, than the SHEEP.

The domestic sheep, in its most valuable or woolly state, exists in perfection chiefly in Europe, and some of the temperate tracts of Asia. When transported into very warm climates, it loses its peculiar covering, and appears coated with hair, having only a short wool next the skin. In very cold countries again, the external part of the wool is observed to be harsh and coarse. In other respects, too, the animal is liable to suffer from the extremes of heat and cold. Its existence in a wild and insulated condition is, perhaps, incompatible with its constitutional propensities. But although much indebted to human care for its preservation and diffusion, we cannot allow that it is the inanimate senseless creature described by Buffon, who represents it as devoid of every art of self preservation; destitute of courage; deprived of every instinctive faculty; as, in short, the most contemptible and stupid of all animals. When enslaved by man, they tremble at the voice of the shepherd, or his dog, but on the extensive mountains where they range almost without control, and where they seldom depend on the aid of the shepherd they assume a very different mode of conduct. In these situations, a ram or a wether will boldly attack a single dog, and often come off victorious; but when the danger is more alarming they have recourse to

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the collected strength to the whole flock. On such occasions they draw up into a body, and place the females and young-ones in the centre, whilst the males take the foremost ranks, keeping close by each other. Thus an armed front is presented in all quarters, that cannot be easily attacked without danger of destruction to the assailant. In this manner they wait with firmness the approach of the enemy: nor does their courage fail them in the moment of attack, for when the aggressor advances within a few yards of the line, the rams dart upon him with such impetuosity, as to lay him dead at their feet, unless he saves himself by timely flight. Against the attacks of single dogs or foxes, when thus ranged in battle array they are perfectly secure. A single ram regardless of danger, will sometimes engage a bull; and his forehead being much harder than that of any other animal, he seldom fails to conquer; for the bull by lowering his head, receives the strokes of the ram between his eyes, which usually brings him to the ground. The sheep in the mountainous parts of Wales, where the liberty they enjoy is so great as to render them very mild, do not always collect into large flocks, but sometimes graze in parties of from eight to a dozen, of which one is stationed at a distance from the rest, to give notice of the approach of danger. When the sentinel observes any one advancing at the distance of two or three hundred yards, he turns his face to the enemy, keeping a watchful eye upon his motions, and allowing him to approach as near as eighty or a hundred yards; but when the suspected foe manifests a design of coming nearer, the watchful guard alarms his comrades by a loud hiss, or whistle, twice, or thrice repeated, when the whole party instantly scour away with great agility, always seeking the steepest and most inaccessible parts of the mountains. Nor is the sheep deficient in that sagacity, which is requisite for the selection of its food; or in that dexterity and cunning by which it occasionally attempts to elude the vigilance of the shepherds, in order to steal such delicacies as are agreeable to its palate. On the hardness with which it endures great severities of weather, its prescience of an impending storm, its fondness of jingling sounds, and its de-

cided social propensities, we need not enlarge, as they must be obvious to the most ordinary observer, and their fleeces are large and well adapted to the various purposes of clothing. Of these the sheep that are bred in Lincolnshire and the northern counties are most remarkable for their size, and for the quantity of wool which they bear. In other parts of England they are generally smaller; and in the mountainous districts of Wales and Scotland they are very small. The fleece, we need hardly mention, affords clothing to myriads of the human race. In this island, in particular, the woollen manufactures form a national staple of industry and wealth, and the utmost attention has been bestowed on crossing and improving the various breeds of sheep. The present annual value of wool shorn in England, is supposed to be about 5,000,000*l.* sterling, of that imported from Spain, about 600,000*l.* and of the whole when reduced to the manufacturing state, 21,000,000*l.* They who are possessed of the best information on the subject, have calculated the number of fleece bearing animals in Great Britain and Ireland, at 30,000,000, of which no fewer than between 3,000,000, and 4,000,000, perish every year by disease,—a heavy public loss, which might be greatly alleviated by a careful and enlightened management of this very valuable quadruped. Besides the fleece, there is scarcely any part of this animal but what is useful to mankind. The flesh is a delicate and wholesome food. The skin dressed, forms different parts of our apparel, and is used for the covers of books. The entrails properly prepared and twisted, serve for strings to various kinds of musical instruments. The bones calcined form materials for tests for the refiner. The milk is thicker than that of cows, and consequently yields a greater quantity of butter and cheese; and in some places is so rich, as not to produce the cheese, without a mixture of water to make it part from the whey. There are in the voices of all animals innumerable tones, perfectly understood by each other, and entirely beyond our power of discrimination. It seems remarkable that the ewe can always distinguish her own lamb, and the lamb its mother, even in the largest flocks. And at the time of shearing, when the ewes are shut up in

a pen from the lambs and turned loose one by one, as they are shorn, it is pleasing to see the meeting between each mother and her young-one. The ewe immediately bleats to call her lamb, which instantly obeys the well-known voice, and returning the bleat, comes skipping to her. At first it is startled by her new appearance, and approaches her with some degree of fear, till it has corrected the sense of sight by those of smelling and hearing. Various sorts of insects infest the sheep, but that which is the most teasing to them is a species of gad-fly (the *œstrus ovis* of *Linnaeus*), that deposits its eggs on the inner margins of their nostrils, occasioning them to shake their heads violently, and thrust their noses into the dust or gravel. The larvæ, or grubs of these insects, when hatched, crawl up into the frontal sinuses, and after they are full fed and ready to undergo their change, they are again discharged through the nostrils. The French shepherds have a practice of trepanning the sheep, and taking out the maggot which relieves them: this is sometimes practised in England, but not always successfully. Sheep have, besides this, a kind of tick (*acarus reduricus*) amongst their wool, and it is very common to see magpies and starlings alight on their backs, and contribute to ease it by picking the insects off. They are subject to a species of fluke worms (*fasciola hepatica*) in the liver.

Of this species there are varieties.

1. *Ovis POLY CERATA* (the many horned sheep). *Horns more than two.* Of this there are many sub-varieties, they occur in the northern parts of Europe, rather than elsewhere. In the *Iceland sheep*, the horns are either three, four, or five in number; sometimes placed with the greatest regularity, and sometimes differing in proportion and situation. *The Icelandic*, or many horned sheep, differ from ours in several particulars. They have straight ears, a small tail, and four or five upright horns. In a few instances these animals are kept in stables during winter; but by far the greater number of them are left to seek their own food in the open plains. In stormy weather they hide themselves in caves from the fury of the elements; but when retreats of this kind are not to be found, they collect together during the heavy falls of snow, and place their

heads near each other with their muzzles downward toward the ground. This not only prevents their being so easily buried under the snow as they otherwise would be, but in many cases enables their owner to discover them. In such situations they will remain for several days; and there have been many instances of hunger forcing them to gnaw each others wool. After the storm is over, they are sought for and disengaged. A good Icelandic sheep will yield from two to six quarts of milk a day; and of this the inhabitants make butter and cheese; but the chief profit is derived from their wool, which is not shorn, but remains on till the end of May, when it loosens of itself, and is stripped off at once like a skin. The whole body is by this time covered again with new wool, which is short and extremely fine. It continues to grow during the summer, and towards autumn becomes of a coarser texture, is very shaggy, and somewhat resembles camel's hair. This covering enables the sheep to support the rigours of winter; but if after they have lost their fleece, the spring prove wet, the inhabitants sew a piece of coarse cloth round the stomachs of the weakest to guard them against taking cold. Surely the care and mercy and wisdom of the great Creator towards these animals, are strikingly manifested in thus providing for them such suitable clothing, to protect them from the rigours of a northern winter, and giving them such instinct as to adopt the best method of preserving their lives in the event of a snow-storm. A *four-horned* variety is very common in Siberia, and among the Tartarian flocks, about the river Jenisei. In the ram of this breed the two largest horns are straight, and nearly upright on the top of the head, while the smaller pair are seated on each side of the head and turned downwards. The body is covered with wool, the fore-part of the neck with yellowish hair about fourteen inches long. They are very mischievous and quarrelsome.

2. *Ovis AFRICANUS* (the African sheep). *Short hair instead of wool.*

3. *Ovis GUINEANSIS* (the Guinea sheep). *Ears pendulous; dewlap lax, hairy, hind-part of the head prominent.* This, which is sometimes termed the Cape sheep, and which is erroneously mentioned in *Buffon's Natural History*, as

of Indian extraction, is supposed to be most frequent in Guinea, and is distinguished from others by its remarkably meagre appearance, length of neck and limbs, pendent ears, and long arched or curved visage. It is covered with hair rather than wool, and has a pair of pendent hairy wattles beneath the neck as in goats. The horns are small, and the tail long and lank. This variety is also considered as a distinct species, in the twelfth edition of the *Systema Naturæ*.

4. *OVIS LATICAUDATA* (the broad-tailed sheep). This extraordinary and awkward variety occurs in Syria, Barbary, and Ethiopia. It is also found in Tartary, Thibet, &c. *The broad-tailed sheep*. In their general appearance, with the exception of the tail, these animals do not differ much from the European sheep. The tail, however, is so large, as sometimes to weigh nearly one-third of the whole carcass. It is entirely composed of a substance betwixt marrow and fat, which serves for culinary purposes instead of butter; and being cut into small pieces, makes an ingredient in various dishes. When the animal is young, this is little inferior to the best marrow. Sheep of this description are usually kept in yards, so as to be in little danger of injuring their tails, as they walk about; but when they run in the fields, the shepherds in several parts of Syria, fix a thin piece of board on the under part, and to this board are sometimes added small wheels; whence, with a little exaggeration, we have the story of the Oriental sheep having carts to carry their tails. Their fleeces are exceedingly fine, long and beautiful; and in Thibet, are worked into shawls, which form a considerable source of wealth to the inhabitants. These sheep are found in the neighbourhood of Aleppo, in Barbary, Ethiopia, and some other of the Eastern countries. Mr. Pennant remarks, that both the broad and long-tailed varieties of this kind were known to the ancients, being mentioned by Aristotle and Pliny; the former mentioning the first, and the latter the second sort. One says the tails were a cubit broad, and the other a cubit long. There are many intermediate races of these sheep, and some have the tails ending in a point, others rather square or rounded; but in every

case their fleeces in fineness, beauty, and length, are equal even to those of Caramina. The Cachemirians engross this wool, and have factors in all parts of Thibet for buying it up, which is sent into Cachemir, and worked into shawls, superior in elegance to those woven even from the fleeces of their own country. This manufacture is a considerable source of wealth. Bernier relates, that in his days, shawls made express for the great Omrahs, of the Thibetian wool, cost a hundred and fifty rupees, whereas, those made of the wool of their own country, never cost more than fifty. These articles of luxury have, till of late, been supposed to have been made with the hair of a goat, till we were undeceived by Mr. Boyle, a gentleman sent by the late Warren Hastings, Esq. sometime Governor-general of India, on a commission to the Tayshoo Lama of Thibet.

5. *OVIS ANKON* (the elbow-sheep). *Fore-legs short, bent like an elbow*. An account has been given of this new and permanent variety being produced without any assignable cause on a farm a few miles from Boston, in North America. It acquired the popular name of the *otter breed*, from the shortness of its legs, and the length of its back. It received the more appropriate title of *Ankon sheep* from the Greek *ἄγκων*, an elbow. The characteristic was, very short legs, particularly the fore-legs, which were bent somewhat like an elbow. The skeleton brought to this country was compared by Sir Everard Home, with the smallest Welsh sheep that could be procured. The bone of the fore-leg of an *Ankon sheep* that weighed forty-five pounds was thicker, but not so long as that of a Welsh sheep, scarcely one-fourth of the weight. The joints of the *Ankon sheep* were looser knit than usual, and the animals was feebler. The mutton was as good, but the fleece rather inferior. In New England, the farms are surrounded only with low wooden or stone fences; the *Ankon sheep* were propagated, because they could not easily get over these fences and injure the corn.

6. *OVIS BUCARICA* (the Bucharian fat-rumped sheep). *Ears large and pendulous; fat cushions on the hips; tail long and flat*. There is another fat-rumped variety, of which the character is, that the cushions on the hips are

larger, and that there is no tail, or if there be a tail, it is so enveloped with fat as to be scarcely visible. The fat-rumped sheep without tails have arched noses, wattles, pendulous ears, and curled horns, like the common sheep. The wool is coarse, long, and in flocks; the legs slender, and the head black; the ears are of the same colour, with a bed of white in the middle. The wool is generally white, sometimes black, or reddish, and often spotted. The buttocks appear like two hemispheres, quite naked and smooth, with the coccygis between scarcely sensible to the touch. These are composed only of suet; whence Dr. Pallas properly styles this variety, *Ovis steato pyga*. These sheep grow very large, even to two hundred pounds weight, of which the posteriors weigh forty. Their bleating is short and deep, more like that of a calf than a sheep. They abound in all the deserts of Tartary from the Volga to the Irtyz, and the Altaic chain, but are more or less fat according to the nature of the pasture, and most so where the plants are of a saline nature. These monstrous varieties are supposed to originate from disease, arising from an excess of fat in the hind parts, which involved, and at length destroyed the tail. By breeding between animals similarly affected, the race was probably continued in those parts where food and climate have concurred to support the same appearances. Those with fat tails, are rather in the way to exhibit such a singular variety, or a mixed breed, between the common and tailless kind. All abound so great in Tartary, that one hundred and fifty thousand have been sold annually at the Orenburg fairs, and a much greater number at Swinkaja, in the Irkut government; bought from the Kirgisian Tartars, and dispersed through Russia. They are very prolific, usually bring two at a time, and often three.

7. *Ovis CAPENSIS* (the Cape sheep). *Ears large, pendulous; tail large and broad.*

8. *Ovis LONGICAUDATA* (the long tailed sheep). *Tail long and woolly.* The long tailed sheep is named both by the Tartars and Russians *Tscherkessian sheep*. It is a handsome animal, with a noble air in its native country and the south of Russia, resembling in its habits, horns, fleece, and length of tail, the Spanish, but more particularly the Eng-

lish sheep. Its head is well proportioned, and of an elegant form; ears straight, horns large, even, rounded in the angles, tapering to a point, and bending inwardly towards the back. The rams are seldom without horns, and the ewes have them often bent in a lunar form. The wool, though coarse, is without admixture of hair, which is, perhaps, but an accidental distinction, and promises to be much meliorated by crossing the breed, and rearing the animal with more care and skill. It is even known to become much finer without the assistance of art, merely from the influence of a temperate climate, as on Mount Caucasus. The tail of the ram is covered with long wool, like the Indian sheep described by Buffon, which trails on the ground, so as to efface the prints made by the animal's feet on the sand, and it contains often twenty joints, or vertebrae. In passing from a state of nature to that of servitude, it seems to have lost its native ferocity, together with its coarse fleece. There are sheep in Morocco which belong to this variety, on account of the distinguishing character of it, a long tail; although otherwise different, in having an ugly look; head covered entirely with hair, little hanging ears, and remarkably long wool.

9. *Ovis ARIES JUBATA* (the Chinese morvant), has a short red and gray mane on the neck, and a long beard on the breast round the neck; on the shoulders are longish red grey hairs; the rest of the body is covered with a bright yellow wool, a little curled and soft at the ends, but coarse at the roots; the legs are deep red; the tail is yellow and white, with long coarse hairs.

The varieties of BRITISH SHEEP are so numerous that at first sight it appears almost impossible to reduce them into any regular classes. They may, however, be divided in *two* ways; *first*, as to the length of the wool; and *secondly*, as to the presence or absence of horns. *THE LONG WOOLLED SHEEP*, that are *hornless*, are chiefly the Teeswater, the old and new Leicester, and the Devonshire notes; *those that have horns* are the Exmoor and the Heath sheep. *THE SHORT WOOLLED SHEEP*, that are *hornless*, are chiefly the Hereford or Ryeland, the South Down, the Cheviot, the Shetland, and the Merinos; *those that have horns* are the Dorsetshire and the Norfolk. *The sheep best suited to arable*

land, an eminent writer observes, in addition to such properties as are common in some degree to all the different breeds, must evidently be distinguished for their quietness and docility; habits which, though gradually acquired and established by means of careful treatment, are more obvious, and may be more certainly depended on in some breeds than in others. These properties are not only valuable for the sake of the fences by which the sheep are confined, but as a proof of the aptitude of the animals to acquire flesh in proportion to the food they consume.

The long woolled large breeds are those usually preferred on good grass lands; they differ much in form and size, and in their fattening quality, as well as in the weight of their fleeces. The *Teeswater* breed is unlike the *Lincolnshire* in their wool, not being so long and heavy; in standing upon higher, though finer boned legs, supporting a thicker, firmer, heavier carcass, much wider upon their backs and sides, and in affording a fatter and finer grained carcass of mutton. The present fashionable breed is smaller than the original species, but yet larger and fuller of bone than the *Midland* breed; and although not so compact nor complete in their form as the *Leicester*, their flesh is nevertheless considered excellent; they fatten quickly, and produce wool of a superior quality. The weight of two-year old wethers is from twenty-five pounds to thirty-five pounds per quarter.

The *Lincolnshire* sheep, or old *Leicestershire* breed, are remarkably large and produce much wool; but their flesh is coarse, and very far inferior in quality to the *South Downs*, the wool also is much coarser. The late Mr. Bakewell improved the *Leicestershire* breed very much by crossing them with the *Lincolnshire*, which forms the new *Leicester*, or *Dishley* breed: they are said to be very profitable to the farmer, on account of the little they eat, but which soon makes them fat. The *Dishley*, or new *Leicester* breed, which seems to have superseded the old *Leicester*, is not only peculiar for its mutton being fat, but likewise for the fineness of the grain and superior flavour above all other long woolled sheep. The weight of ewes, three or four years old, is from eighteen to twenty-six pounds per quarter, and of wethers two years old

from twenty to thirty pounds. The wool on an average is from six to eight pounds per fleece. They are distinguished from other long woolled breeds by their clean heads, straight, broad, flat backs, round, barrel-like bodies, very fine small bones, thin pelts, and an inclination to make fat at an early age. The *Devonshire* wethers have white faces and legs, thick necks, narrow backs, and back-bone high; they are of the long woolled kind, weight nearly the same as the *Leicester*, but the wool heavier and coarser.

The shorter woolled varieties, and such as, from their size and form, seem well suited to hilly and inferior pastures, are also numerous. Generally speaking, they are too restless for enclosed arable land, on the one hand, and not sufficiently hardy for heathy mountainous districts on the other. To this class belong the *Dorset*, *Hereford*, *South Down*, *Norfolk*, and *Cheviot* breeds. The *Dorsetshire* sheep are generally horned, white faced, with small white legs, and thin carcass. The wethers, three years and a half old, weigh from sixteen to twenty pounds per quarter: wool fine and short; the weight of the fleece from three to four pounds. There is one peculiarity belonging to these sheep; they produce lambs twice in the year, in September or October, and again in the spring. The London supply of house lamb at Christmas is from this county. The *Wiltshire* sheep are a variety of this breed, which, by attention to size, have got considerably more weight—viz. from twenty to twenty-eight pounds a quarter. They in general have no wool upon their bellies, which gives them a very uncouth appearance. The variations of this breed are spread through many of the southern counties, as well as many in the west, and which varieties continue northward until they are lost amongst those of the *Lincolnshire* breeds. The *Herefordshire* sheep are destitute of horns; legs and faces white, and the wool growing close to their eyes. The mutton is excellent; wool short and fine, the weight of the carcass from ten to eighteen pounds per quarter, and of the wool from one and a half to two and a half pounds a fleece. Hardly any two animals are more unlike than the small dun-faced sheep and the *Leicester* or *Dishley* male. The *South Down* sheep are without horn: they

have dark or black gray faces and legs, fine bones, long small necks; are low before, high on the shoulder, and light in the fore quarter; the sides are good, and the loin tolerably broad, back-bone too high, the thigh full, and twist good. The fleece is very short and fine, weighing from two and a half to three pounds. These sheep have been brought to a high state of perfection by Elman, of Glynd, and other intelligent breeders. It is on the South Down hills, near Brighton and Worthing, in Sussex, abounding as they do in wild thyme and other odoriferous herbs, that these excellent sheep are brought to the greatest perfection. The exquisite flavour and sweetness of the meat, and the smallness of the leg bones, are well known to those who live in the vicinity of the South Downs, and which will ever recommend this mutton as the very best that can be obtained. *The Norfolk sheep* have black faces, large and spiral horns, a small, long, thin, weak carcass, and narrow chines. Weight from sixteen to twenty pounds per quarter. The wool short and fine, from one and three quarters to two pounds per fleece. These sheep have a voracious appetite, and are so restless and unquiet that it is difficult to keep in any other place than large sheep walks or commons. The mutton is very excellent. A three or four years old Norfolk wether will produce a haunch, which, if kept two or three weeks, will vie with that of any animal excepting a buck. *The Cheviot breed* are without horns, the head bare and clean, with jaws of a good length, faces and legs white; weight from twelve to eighteen pounds per quarter; fleece of a medium length and fineness, weighs about three pounds on an average.

Of those races of sheep that range over the mountainous districts of Britain, the most numerous is the *Heath* breed. These sheep have long spiral horns, black faces and legs, wild looking eyes, and short firm carcasses, covered with long open shagged wool. Weight from ten to sixteen pounds a quarter, and they carry from three to four pounds of wool each. At three or four years old they are fattened. They fatten well, make excellent mutton, and highly flavoured gravy. There are different varieties to be found in all the western counties of England and Scot-

land, from Yorkshire northwards, and a finer fleece would render them the most valuable upland sheep in Britain. *The Herdwick sheep* are peculiar to that rocky mountainous district at the head of the Duddon and Esk rivers, in the county of Cumberland. They are without horns, have speckled faces and legs; wool short, weighing from two to two and a half pounds per sheep, which, though much coarser than that of any of the other short woolled breeds, is yet much finer than the wool of the *Heath* sheep. The mountains upon which these sheep are bred, and also the stock itself, have, time immemorial, been farmed out to herds, and from this circumstance their name is derived. *The dun faced breed*, still exists in most of the counties to the north of the Frith of Forth, though only in very small flocks. Of this ancient race (said to have been imported from Denmark or Norway, at a very early period), there are now several varieties. *The Hebrion sheep* is the smallest animal of its kind. It is of a thin, lank shape, and has usually straight short horns. The face and legs are white, the tail very short, and the wool of various colours. Sometimes of a bluish green, brown, or deep russet, and sometimes all these colours meet in the fleece of one animal. The average weight of this poor breed, even when fat, is only five or five and a half pounds per quarter, or about twenty pounds per sheep. It is often much less: only amounting to fifteen or sixteen pounds. The quantity of wool which the fleece yields rarely exceeds one pound weight, and is very often short of even half that quantity. The quality of the wool is different on different parts of the body, and inattention to separating the fine from the coarse, renders the cloth made in the Hebrides very unequal and precarious in its texture. *Of the Zetland sheep* it would appear there are two varieties, one of which is considered to be the native race, and carries very fine wool; but the number of these is much diminished, and in some places they have been entirely supplanted by foreign breeds; the other variety carries coarse wool above, and soft fine wool below. They have three different succession of wool yearly, two of which resemble long hair, more than wool, and are termed *fors* and *scudda*. When the wool begins

to loosen in the roots, which generally happens about the month of February, the hair or scudda, spring up, and when the wool is carefully plucked off, the tough hairs continue fast until the new wool grows up about a quarter of an inch in length, then they gradually wear off; and when the new fleece has acquired about two months growth, the rough hairs, termed *fors*, spring up and keep root until the proper season for pulling it arrives, when it is plucked off along with the wool, and separated from it, at dressing the fleece, by an operation called *forsing*. The scudda remains upon the skin of the animal as if it were a thick coat, a fence against the inclemency of the seasons, which provident nature has furnished for supplying the want of the fleece. The wool is of various colours; the silver gray is thought to be the finest, but the black, the white, the *mourat*, or brown, is very little inferior, though the pure white is certainly the most valuable for all the finer purposes, in which combing wool can be used. Their average weight in the county of *Kincardinshire*, where there is a remnant of this ancient race, distinguished by the yellow colour of the face and legs, and by the dishevelled texture of the fleece, to from seven to nine pounds per quarter, and the mutton is remarkably delicate and high flavoured. It is very singular that in the *Holms round Kirkwell*, in the *Island of Mainland*, one of the *Orkneys*, if a person about the lambing-time enters with a dog, the ewes suddenly take fright, and through the influence of fear, as it is imagined, they instantly drop down dead, as though their brain had been pierced by a musket ball. The last variety to be named is the *Spanish* or *Merino* breed, producing the finest wool. The males usually have horns of a middle size but the females are frequently destitute of them; the face and legs white, and the bones fine. The average weight of a fat ram is about seventeen pounds; and that of ewes about eleven pounds per quarter. Average weight of the fleece from three to five pounds. The wool has a dark brown tinge on the outside: but underneath it is of a rich white, and the skin of a rosy hue, forming a striking contrast. This species was first brought into England in 1788. In 1911, a *Merino*

Society was formed for the purpose of extending and encouraging the growth of this breed. The wool of the *Merinos* in England is not so fine, as the *Spanish* wool; but the carcass has been improved; and this is a very material object to the farmer. The quality of the *English* wool may be improved by crossing the *English* breeds with *Merino* rams. Nothing, however, has tended to render the species more unsightly to the *English* eye than the large tufts of wool which covers the head: it is of very inferior quality, and classes with what is produced on the hind legs; on which account it does not sort with any of the *three* qualities, viz. *ragino*, or prime; *fino*, or second best; and *terano*, the inferior sort; and, consequently, is never exported from Spain. The following is an account of the effects of cross-breeds between *Merinos* and *South-downs*. The fleeces of the first cross (between *Merinos* and *South Downs*) washed, are to the parent *South Downs*, as six to five in weight, and as three to two in value per pound. Thus,

100 *South Down* fleeces, 2½ lbs. each, @ 2s. £ 25.
100 First cross. 3lbs. each. @ 3s. £ 45.

This is an evident improvement in the wool; and the form and disposition to fatten are likewise improved.

OF BREEDING AND REARING SHEEP.

The first method is called *breeding in and in*; the meaning of which is, that males and females of the same family should be put together. Some farmers disapprove of this; the late Mr. *Bake-well*, after an experience of a great many years, very greatly improved the breed of sheep by this method. The criteria of an excellent ram is of great importance, and combines qualities which ought to be found in every breed of sheep, cultivated for its flesh and wool. His head should be fine and small, his nostrils wide and expanded, his eyes prominent, and rather bold or daring, ears thin, his collar full from his breast and shoulders, but tapering gradually all the way to where the head and neck join, which should be very fine and graceful, being perfectly free from any coarse leather hanging down; the shoulders broad and full, which must at the same time, join so easy to the collar forward and chine backward, as to leave not the least hollow in either place; the mutton upon his arm of fore

thigh, must come quite to the knee; his *legs* upright, with a fine clean bone, being equally clear from superfluous skin, and coarse hairy wool from the knee and hough downwards; the *breast* broad and well formed, which will keep his fore-legs at a proper width: his *girth* or *chest* full and deep, and instead of a hollow behind the shoulders, that part by some called the fore flank, should be quite full, the *back* and *loins* broad, flat and straight, from which the ribs must rise with a fine circular arch; his *belly* straight, the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his *twist* (or junction at the inside of the thighs), deep, wide, and full, which, with the broad breast will keep his fore-legs open and upright, the whole body covered with a pelt, and that with fine bright wool.

The criteria of a sound healthy sheep are a rather wild or lively briskness; a brilliant clearness in the eye; a florid ruddy colour on the inside of the eyelids, and what are termed the eye-strings, as well as in the gums; a fastness in the teeth; a sweet fragrance in the breath; a dryness of the nose and eyes; breathing easy and regular; a coolness in the feet; dung properly formed; coat or fleece firmly attached to the skin, and unbroken; the skin exhibiting a florid red appearance, especially upon the brisket. Where there are discharges from the nose and eyes, it indicates their having taken cold, and should be attended to, by putting them in dry sheltered situations. This is a necessary precaution also, when they are driven upon a road. *The nearer any breed of sheep comes up to the above description, the nearer they approach towards excellence of form. It is a very common practice to let out rams for hire by men who rear sheep for this purpose. In crossing the breeds of sheep it has been found advantageous to breed from different families of the same race. The families may be kept distinct, and occasionally intermixed with good effect. Another method is by crossing two distinct breeds or races, one of which possesses the properties which it is wished to acquire, or is free from the defects which it is desirable to remove. In October, or early in November, the rams are put to the ewes; and the time of gestation with*

sheep is twenty-one weeks, so that the lambs are dropped in March or April. The utmost care and attention is required from the shepherds in the lambing season, both as it respects the lambs and their mothers, or the farmer may sustain much loss, and hence a good careful shepherd is a most valuable servant. A few days before the time of lambing, the ewes are collected for the purpose of being *udder locked*. The sheep are raised upon their buttocks, their backs to the operator, who then bends forward and plucks off the *locks* of wool growing on or near the udders, for the purpose of giving free access to the expected lambs. This operation is not without danger, and frequently produces premature births. When the weather is favourable, after a considerable number of the ewes have lambed, they are collected into a fold, and all the male lambs are castrated, except a few of the best reserved for rams. It is better to perform this severe but necessary operation when the lambs are only a few days old. The ewes are never spayed. Those ewes which are later in lambing are separated from the flock, and kept by themselves, that they may be more under the eye of the shepherd. They should be allowed finer grass for a few weeks after having dropped their lambs, that the lambs may be as strong and thrive as much as the others, or become fat by the month of August, so that the ewes may not be injured by suckling them. It is a very common practice to wash sheep in the month of June, before they are shorn. Washing is still generally practised; this has, however, been objected to on account of the wool being so long in drying; and in wet and cold weather the sheep are incommoded by it. It has been, therefore, recommended to wash the wool after it is shorn, as they do in Spain. *The shearing of sheep is an annual operation, which includes several preparatory measures and after-processes. These are washing, separation, catching, clipping, marking, and tail-cutting. The proper time for clipping or shearing sheep must be directed by the state of the weather, and the climate in the particular district, as by this means the danger of injury by cold, from depriving the sheep of their coats at too early a season; and from heat, by permit-*

ting the wool to continue on them too long; may be avoided in the best manner, but another circumstance should be attended to respecting the proper time of shearing, which is that of the wool being fully grown or in a state of maturity when the clipping is performed, for if the sheep are shorn before the wool is fully grown, as is said in the *Annals of Agriculture*, to be weak and scarcely capable of being spun, and if protracted later, it is yellow, felted, and of an imperfect nature. In warm and sheltered situations, in the southern counties of Britain, the beginning or middle of June, when the weather is fine, is a suitable season; but in the north, the middle or latter end of June will be a more proper time. Sheep who are fattened must be shorn earlier, as the heat of the weather, together with the warmth of the fleece, is very oppressive to them, and injures their feeding. The proper time for shearing can always be ascertained, because the separation of the old wool from the new is always distinctly marked in a thriving sheep; and this happens earlier or later, according to the condition of the animal. Hence, from the beginning of May or earlier, till the first week in July, shearing goes on in different districts, beginning with the fat Leicester wethers, and ending with the small nursing ewes of the highland districts. From the middle of May to the middle of June is the busiest period. *Sheep-shearing in Romney Marsh* commences about Midsummer and finishes about the middle of July. Those who shear first, think they escape the effects of the fly; and those that shear late, apprehend they gain half a pound weight in every fleece by the increased perspiration of the sheep. *Clipping off the coarse soiled wool* about the thighs and docks, some weeks before the usual time of washing and clipping the sheep, is an excellent practice, as it keeps the sheep clean and cool, and prevents the udders of the ewes from becoming sore. *In separating for the purpose of washing*, the flock is brought to the side of the washing-pool, and there lambs and sheep of different kinds, fit to be washed, are put into separate fields; and such lambs as are too young to be clipped, are not washed, but confined in a field or enclosure of any kind, at such a distance from the washing-place, as that

they may not disturb their mothers by their bleating.

The object of washing is simply to free the fleece from dust and dirt of various kinds. *The common method of catching the sheep*, in order to lay it on its back to be shorn, is by the hinder leg, drawing the animal backward with a crook, to the adjacent shearing place; the hand holding the leg, to be kept low, when at the place it is turned on its back; or they are moved bodily, or one hand placed on the neck, and another behind, and in that manner walked along: the first or common mode he thinks the most safe. *In performing the operation of shearing*, the left side of the sheep is placed against the shearer's left leg, his left foot at the root of the sheep's tail, and his left knee at the sheep's left shoulder. *The process commences* with the shears at the crown of the sheep's head, with a straight cut along the loins, returning to the shoulder, and making a circular shear around the off side to the middle of the belly; the off hinder leg next; then the left hand holding the tail, a circular shear of the rump to the near hock of the sheep's hind leg; the two fore feet are next taken in the left hand, the sheep raised, and the shears set in at the breast, when the remaining part of the belly is sheared round to the near stifles; lastly the operator kneeling down on his right knee, and the sheep's neck being laid over his left thigh, he shears along the remaining side. *The fleece being removed is wound up*; that is deprived of any clotted wool or dirty part, and lapped with the shorn side outwards, beginning at the breech and ending at the shoulders, where the neat wool serves as a bandage. *Marking* is performed on each sheep about a week after the fleece is removed, and very commonly immediately after the shearing. The object of this is to identify the sheep by the owner. The initials of the owner's name are dipped in warm tar and impressed upon each of the sheep. *Shortening the tails of the sheep* is performed in almost all the sheep districts of the kingdom except in Dorsetshire; it appears to be a useful practice; especially with long-woolled sheep, in keeping the animals clean behind, and of course less liable to be stricken with the fly.

In the practice of sheep husbandry,

different methods are practised according to the extent and nature of the farms on which they are kept, and the methods of farming adopted on them; but under all circumstances the best sheep-masters constantly endeavour to preserve the sheep in as good condition as possible at all seasons. With the pasture kinds of sheep this is particularly the case; and with the view of accomplishing it in the most complete manner, it is useful to divide them into parcels or lots, in respect to their ages and sorts, as by that means they may be kept with greater convenience and benefit, than in large flocks together, under a mixture of different kinds. In this way there is not only less waste of food, but the animals thrive better, and feed easier. The advantage of this management has been fully experienced in many of the northern districts, where they usually divide the sheep stock into lambs, yearlings, wethers, and breeding ewes: and by this method it appears not improbable that a much larger proportion of stock may be kept, and the sheep be preserved in a more healthy condition. With a breeding stock the sheep-master, must act according to his circumstances, situation, and the capital which he possesses, either selling the lambs, fattening them for grass lamb, suckling them for house lamb, or keeping them on to be grazed or sold as store or fat wethers; the ewes being sold lean or in store condition, or fattened as circumstances, profit, and convenience, may point out.

Another practice, but which requires much capital, as well as knowledge, experience, and attention, is that of breeding and fattening off all lambs, both wethers and ewes, especially when convenient markets for selling them when fat are near at hand. This system may be partially acted upon varying the plan, according to circumstances, and the nature of the times. Whenever store stock becomes extravagantly high, it is a good way to sell. The sheep-farming of the arable or low warm districts of the kingdom, consequently differ in various particulars from that of the hilly and mountainous districts. Rearing and management of sheep on rich grass and arable lands. The most general sheep-husbandry on rich lands, or where turnips and other green food is raised for winter con-

sumption, is to combine the breeding and feeding branches, leaning to each according to the returns of profit. A method very common among arable farmers, and which is attended with the least trouble and hazard, is that of purchasing a store flock as lambs, wethers, and what are termed crones, or old ewes; some of the last sort often proving with lamb, may be fattened off with the lambs to good account. Ewes are often sold in lamb, or with lambs by their sides, in what are termed couples. It is a good practice to purchase couples annually; fatten them together, and sell them within the year. When sheep are bought at distant fairs, they should be entrusted to a careful drover to conduct them home, and not travel more than twenty miles a day. The treatment of lambs is the first consideration in the mixed sheep husbandry. Lambs are either suckled or fattened on grass, or sold in autumn as lean stock. With regard to those that have been suckled or fattened in the house, much attention is required to have them early, to their being well, regularly, and very cleanly kept and suckled, as well as to the ewes being of the right sort, and the best milkers that can be provided, and to their being fully supplied with food of the most nourishing and succulent kind. Their tails and udders should have the wool well clipped away from them, in order that they may be preserved in a perfectly clean state. The selection, or setting of the lamb stock, is the first business of sheep management after the lambs have been weaned. It is generally performed in the month of July or August. In making this selection the farmer rejects all that manifest any departure from certain signs of the true breed, whatever that breed may be. The rearing of housed lambs is a curious process and thus described. "The sheep which begin to lamb about Michaelmas, are kept in the close during the day, and in the house during the night, until they have produced twenty or thirty lambs. The lambs are put into a lamb-house, which is kept constantly well littered with clean wheat straw; and chalk both in lump and powder is provided for them to lick, to prevent looseness and preserve their health. A little wheat-straw with the ears downwards is placed within reach

to prevent them from gnawing the boards or each others wool. They are kept carefully until fit for the butchers. *The mothers of the lambs* are turned into the lamb-house during the night. In the morning the ewes are turned into the pastures at six o'clock; and at eight o'clock ewes, whose lambs are sold or who have lost their lambs, are brought in, and held by the head until the lambs by turns have sucked them clean. At twelve o'clock the ewes again suckle the lambs for an hour; at four o'clock the ewes which have no lambs are again suckled, and at eight o'clock the mothers of the lambs are brought to them for the night. This method of suckling is continued all the year. At about eight weeks old the lambs are selected for slaughter, and sent to market during December, and three or four succeeding months, at prices which vary from one to four pounds; and the rest of the year at about two pounds each. *The diseases of the sheep are numerous.* They are especially subject to what the shepherds call *the rot*; which popular term, in fact, includes a variety of diseases. Sheep are also subject to *murrain*. This disease is epidemic and often fatal. In addition to the rot and murrain, may be mentioned *giddiness of the head*, which also often proves fatal. Many causes have been assigned for the disease called the rot, the fluke-worm, particular plants, and the overflowing of their pastures by water. From whatever causes this disease proceeds, it will rapidly spread through a whole flock and prove fatal. Sheep fed on Irish bogs or salt marshes, are said to be secure from it. *The signs of the rot* are easily discerned by the shepherds. The sheep first loose flesh, and what remains is flabby and pale; they also lose their vivacity, look sad, their eyes are glossy, and their breath is foetid; sometimes they are costive, and at other times have a black purging. The wool readily comes off. The disease is in some cases more rapid than in others, but always proves fatal at last. It is a disease impossible to cure, unless it be of a mild nature and proper remedies be early applied. A total change of food seems to be the first step to be taken, and that to be of the dry kind, such as the meal of wheat, barley, oats, pease, beans, &c.

These may be mixed with carrots, broom, elder, &c. which have been recommended as diuretics. *Flesh's Patent Restorative for Sheep*, consists of turpentine, sal ammoniac, turmeric, quicksilver, brimstone, salt, opium, alkanet root, bark, antimony, camphor, and distilled water; but it is the salt only that would be useful; the quantities of the other articles being too small to be available. When the liver is much effected, the belly of the sheep should be rubbed with mercurial ointment every other day for a week. In some cases the progress of the disease is not so rapid, and the sheep effected will thrive well under it for a time. Some graziers are aware when the sheep begin to decline, and kill them for market, just in the right time to sustain no loss. Sheep are also subject to *the scab*; this causes a violent itching, and the wool to come off; the application of nitre and tobacco water (but particularly the latter), will soon cure it. It is a disease which greatly distresses the poor animals, and requires to be quickly attended to, or it may cause all the wool to come off and ultimately prove fatal to the sheep. They are also subject to worms in the nostrils and head, and to a pining disease described by Mr. Hogg, the Ettrick Shepherd, under which they waste away. He says, "It is most fatal in a season of drought; the months of June and September are the most deadly months, and if the shepherd have not the means of changing the pasture, all those affected will fall in the course of a month."

ON SWINE.

Sus, the hog, in zoology, a genus of the Class, and Order *Mammalia belluæ*, of which the generic character is as follows:—*The four upper fore-teeth are convergent; the lower six are prominent; the two upper tusks are shorter; the two lower standing out; the snout prominent, truncate, and moveable; and the feet mostly cloven.*

The individuals of this genus dig in the earth with the snout, which is furnished at the end with a strong round cartilage; they feed indifferently upon almost every thing, even the most filthy; they wallow in the mire, and are in general extremely prolific. There are six species.

1. *Sus AFRICANUS* (or Cape hog). *Two fore-teeth in the upper jaw.* This hog is of a superior size, and is peculiar to Africa. The head is long; the snout slender; tusks large, and hard as ivory; and that in the upper jaw thick, and truncated obliquely; the ears are narrow, erect, and pointed; the tail is slender, and terminating in a tuft, reaching down to the highest point of the leg; both jaws furnished with twelve grinding teeth; the body is covered all over with long fine bristles. This species has sometimes been confounded with the *Æthiopicus*, but the form of the head, the structure of the mouth, and the manner in which the body is covered, establish a sufficient specific difference. It is found in abundance between the Cape de Verde and the Cape of Good Hope.

2. *Sus ÆTHIOPICUS* (or Ethiopian hog). *This species has no fore-teeth; under the eyes is a soft wrinkled pouch.* The manners and economy of this species are but very imperfectly known. They live chiefly under ground, where the texture of their snout enables them to make their way as readily as the mole. It inhabits Madagascar, and the hot parts of Africa. They are, in fact, diffused from Sierra Leone to Congo. The Ethiopian hog is nearly *five* feet long, and between *twenty-four* and *thirty* inches in height; the body is thick and broad; the snout is somewhat horny; the mouth is narrow, as well as destitute of fore-teeth, but it is furnished with hard gums to supply their functions; the tusks in the lower jaw are small, in the upper very large; the eyes are small, and situated high in the forehead, the horizontal lobe or wattle under them intercepting from the sight of the animal all objects placed immediately below. The skin is of a dusky hue; the bristles thinly dispersed in separate parcels over the body, between the ears, and on the shoulders longer than on any other parts.

3. *Sus BABYRUSSA* (the Indian hog). The Babyrussa is described by Dr. Shaw, to be nearly of the size of a common hog, but of a somewhat longer form, and with more slender limbs, and to be covered, instead of bristles with fine, short, and somewhat woolly hair, of a deep brown or blackish colour, interspersed with a few bristles on the upper and hinder part of the back. It

is also distinguished by the very extraordinary position and form of the upper tusks, which instead of being situated internally on the edge of the jaw as in other animals, are placed externally, perforating the skin of the snout, and turning upwards towards the forehead; and as the animal advances in age, becoming so extremely long and curved as to touch the forehead. These continue their curvature downwards, by which means they lose their power as offensive weapons. The upper tusks are of a fine hard grain, like that of ivory; the tusks of the lower jaw are formed as in the rest of the genus, and are also long, sharp, and curved, but not of equal magnitude with those of the upper; the eyes are small; the ears somewhat erect and pointed; the tail rather long, slender, and tufted at the end, with long hairs. It inhabits Buero, a small isle near Amboyna; it is also found in Cœlebes, but not on either of the continents of Asia or Africa. They are sometimes kept tame in the Indian isles; live in herds, have a very quick scent, feed on herbs and leaves of trees, never ravage gardens like other swine, and their flesh is well-tasted. When pursued and driven to extremities, they rush into the sea, swim very well, and even dive, and pass thus from isle to isle. In the forests they often rest their heads, by hooking their upper tusks on some boughs.

4. *Sus PORCUS* (the Guinea hog). Has no bristles; the hinder part of the back is covered with long hairs; the tail is long and naked, and hangs down to the ground; the ears are rather long and much pointed; and the body is covered with short and shining red hairs. There is a variety called the Siamese hog. Both are smaller than the common hog.

5. *SUS TAJASSUS* (the Tajassu, Pecary, or Mexican hog). With four cutting teeth above and six below; two tusks in each jaw, those in the upper jaw pointing down, and little apparent when the mouth is shut, the others hid. The length from the nose to the end of the rump about three feet; the head not so taper as in common swine; ears short and erect; the body covered with bristles, stronger than those of the European kind, and more like those of a hedge-hog, of a dusky colour, surrounded with rings of white, those on the top of

the back and neck are nearly five inches long, shorter on the sides, and the belly almost naked. From the shoulders to the breast is a band of white; the animal has no tail; on the lower part of the back is a gland open at the top, discharging a foetid ichorous liquor; this gland has been mistaken for a navel. The Mexican hog inhabits the hottest parts of South America, and some of the Antilles; lives in the forests on the mountains, but is not fond of mire or marshy places, and not so fat as the common hog. These hogs go in great droves, are very fierce, and will fight stoutly with beasts of prey. The jaguar, or American leopard, is their mortal enemy; and the body of the leopard is often found slain in combat with many of these hogs. Dogs will scarcely attack this animal, if wounded, it will turn on the hunters. They feed on fruits and roots, also on toads and all manner of serpents, which they hold with their fore-feet, and skin with great dexterity. The flesh is reckoned very good food; but all writers agree that the dorsal gland must be cut out as soon as the animal is killed, or the flesh will become so infected as not to be eatable. The Indian name of this species is *Paquirus*, whence is derived that of Pecary. The habits of the Mexican hog are not very different from those of Asia and Europe. Their instincts and arms of offence and defence, are the same as those of our own hogs, but they seem to possess dispositions much more gregarious. Though only an individual be singled out, the whole body join together against an enemy. They grunt with a stronger and harsher voice than the hogs of Asia and Europe. They produce a number of young at a litter, and the mother treats them with the tenderness and solicitous care of a kind parent. Though existing in a wild state, they are susceptible of domestication, but nothing can overcome their natural stupidity.

6. *Sus SCROFA* (the hog). Having the body covered with bristles; two large teeth above and below. There are four varieties.

1. *Sus SCROFA ferus* (the wild hog). Is of a dark brown colour, and beneath the bristles is a soft short hair, the ears are short and a little rounded. It is found wild in most parts of Europe. In

the forests of South America there are vast droves, which derive their origin from the European kind, relapsed into a state of nature, and are what Mr. Bancroft, in his *History of Guinea*, describes as a particular species by the name of *warree*. They cannot bear excessive cold, inhabit wooded countries, and are very swift. In America, they are very useful in clearing the country of rattlesnakes, which they devour without danger. The external form of the body of this hog is very unwieldy; yet, by the strength of its tendons, the wild boar is enabled to fly from the hunters with amazing agility; the back toe on the foot of this animal prevents its slipping, while it descends declivities, and must be of singular use when pursued. As to the age of these animals, it is said the life of the wild boar may be extended to twenty-five or thirty years. The flesh of the wild boar was esteemed a great delicacy by the ancient Romans. The wild sow, which every way resembles the domestic kind, produces only once a year. This difference in fertility is probably owing to want of nourishment, and the necessity of suckling her pigs much longer than the domestic sow, which is never allowed to nurse her young above fifteen days or three weeks. The wild boar was formerly a native of England, as appears from the laws of Hael Dha, who permitted his grand huntsman to chase that animal from the middle of November to the beginning of December. William I. punished with the loss of their eyes any that were convicted of killing the wild boar, the stag, or the roebuck; and Fitz-Stephen tells us that the vast forest, that in his time grew on the north side of London, was the retreat of stags, fallow-deer, *wild boars*, and bulls. Charles I. turned out wild boars, in the New Forest, Hampshire, but they were destroyed in the civil wars. On the Continent, the wild boar is hunted with dogs, or killed by surprise during the night, when the moon shines. As he runs slowly, leaves a strong odour behind him, and defends himself against the dogs, and often wounds them dangerously; fine hunting dogs are unnecessary, and would have their noses spoiled, and acquire a habit of moving slowly by hunting him. Mastiffs, by very little training, are sufficient. The oldest, which are

known by the track of their feet, should only be attacked: a young boar of three years old, is difficult to hunt down, because he runs very far without stopping. But the older boars allow the dogs to run near, and often stop to repel them. During the day, he commonly remains in his covert, which is in the most sequestered part of the woods. He comes out in the night in quest of food. In summer, when the grain is ripe, it is easy to surprise him among the cultivated fields, which he frequents every night. As soon as he is slain, the hunters cut off his testicles, the odour of which is so strong that in a few hours it would infect the whole carcass. The ancients castrated the young boars, which they could carry off from their mothers, and returned them to the woods, where they grew fat, and their pork was much better than that of domestic hogs.

In Russia, between the Ural and the Yamba, they are very numerous, and are hunted by the Cossacks, but not without much danger. Although they feed solely on the roots of sea-weed and sedge, they grow to such an extraordinary size, that they are frequently found weighing upwards of six hundred pounds; their bacon is nearly four inches thick in fat, though their flesh is in general dry, firm, and well-flavoured. The wild boar of Egypt has no shelter, continually exposed to the rays of a burning sun, he roams over the hottest sands, where he with difficulty finds a few sheltered shrubs, which afford him a scanty subsistence, and scarcely any shade. He is also frequently seen in the deserts of Nitria, which is the resort of a greater number of animals than any other part of the deserts, on account of the sheets of water it contains, and of the plants that grow on their banks. These boars are solitary. Among hunters, the wild boar has several names, according to its different ages: the first year, he is called a *pig of the saunder*; the second, a *hog*; the third, a *hogsteer*; the fourth, a *boar*. Wild boars do not separate from their mothers until the third year, and till that age are called by the hunters *stock beasts*, or beasts of company. They never wander alone till they have acquired sufficient strength to resist the attacks of the wolf. Though gluttons,

they do not attack other animals to devour them, although they eat flesh when they meet with it.

2. *SUS SCROFA, domesticus mongulus* (the angle-hoofed hog). Has undivided hoofs on all the feet, and resembles the common kind in every thing else. They inhabit Upsal, in Sweden, and other places, and are mentioned by the ancients.

3. *SUS SCROFA domesticus Sinensis* (the Chinese hog). Has the back almost naked, and the belly hanging down to the ground; the legs are short, and the tail short and pendulous. They are common in China, the islands in the Indian Ocean, and South Sea, and in New Guinea. They are cultivated in Europe, and are much more cleanly than the common hog.

4. *SUS SCROFA DOMESTICUS* (the domestic hog). Has the ears long, sharp-pointed, and slouching; the colour generally white, sometimes mixed with other colours. In a tame state, it is universal, except in the frigid zones, and in Kamschatka, where the cold is very severe. Since its introduction into America, by Europeans, it abounds to excess in the hot and temperate parts. Of all quadrupeds, the hog is the most rude and brutal. All his habits are gross; all his appetites are impure; all his sensations are confined to a furious lust, and a brutal gluttony. He devours indiscriminately every thing that comes in his way, even his own progeny, the moment after their birth. This voraciousness seems to proceed from the perpetual cravings of his stomach, which is of an immoderate size; and the grossness of his appetites, it is probable, arises from the bluntness of his senses of taste and of feeling. The rudeness of the hair, the hardness of the skin, and the thickness of his fat, render these animals less tender to blows. The other senses of the hog is very good. The parts of this animal are finely adapted to its way of life. As its method of feeding is by turning up the earth with its nose for roots of different kinds, so it has a more proper form than other animals; a strong brawny neck; eyes, small, and placed high in the head; a long snout; nose callous and tough; and a quick sense of smelling out its food. *Tame hogs* are often very troublesome in cultivated

grounds, ploughing them up with their snouts, and thus entirely frustrating the labours of the agriculturist.

The hog is in a very considerable degree beneficial to mankind. The flesh of all the different species of swine and at all ages, is a very substantial, agreeable, and nutritious aliment; and, in their proper seasons, the different sorts of provisions thus supplied are all excellent. Pork, though it might be wisely forbidden in some warm countries, is found equally nutritive and salutary here. As such it furnishes a very large proportion of that food which is vended in our markets. It affords numberless materials for the table of the epicure. Among these is brawn, which has still many admirers, and is a rarity that seems peculiar to England, where it is produced in the greatest perfection. Pork takes salt better than the flesh of any animal, and is, in consequence, preserved longer, and always makes an important article in naval stores. The lard of the hog is essential to the cook and confectioner; it is used in various medical preparations, and is compounded by the perfumer into pomatum. The bristles are made into brushes, and are, moreover, of great use to the shoemaker. The skin is worked into coverings for pocket-books, and other articles.

The appearance of the hog is always drowsy and stupid. He delights to bask in the sun, and wallow in the mire. An approaching storm seems to affect his feelings in a very singular manner. On such occasions, he runs about in a frantic state, and utters loud shrieks of horror. In the choice of herbs, they are more delicate than any other herbiferous animal, yet devour the most nauseous and putrid carrion with more voracity than any beast of prey. Sometimes, even infants when unprotected, have been destroyed by them. Millers, brewers, distillers, dairymen, and others, feed swine with advantage. They may also be fed with potatoes, as they usually are in Ireland and the west of Scotland. Berkshire and Hampshire hogs are in great estimation in England.

The boar, or male, is chosen with great care when he is intended for propagation, and is thus employed from

the age of two to five years, and then either sold or fattened. The males not allotted to this use are castrated, sometimes at the age of six weeks, sometimes six months, and then fed to a great size, either for sale or for use. Sows are kept for breed generally from one year old to seven, and are then fattened. The period of *gestation* in swine is about four months; so that two litters may be obtained in a year. The sow usually produces ten or twelve pigs. Some cottagers and others, by taking great care of breeding sows and the frequent litters of pigs they produce, have made much profit. The large kinds are the best for bacon, and the smaller kinds for pork. There are breeders who sell their stock when quite young, as *sucking pigs*. These are in season in London especially, at all times of the year; it is therefore necessary that those who breed this kind of stock should have the sows to farrow in different months of the year. This kind of live stock is of much importance to farmers; as pigs are fed upon a variety of things which other animals would reject, and on this account the feeding them is not so expensive as the fattening of other animals. There are many varieties which need not be particularly specified; the small breeds are generally most beneficial to the farmer, being fattened at the least expense. In farm-yards, in stubble fields, or under oak trees, where acorns are plentiful, they will feed themselves with very little trouble and very small expense to the farmer. They will eat or drink any thing. Whey, sour milk, offal, grain, yams, potatoes, or turnips. Clover and tares may in the summer months also be given them to eat. The farmer cannot rear a more beneficial stock than swine, if it is not too numerous for the food upon which they are fed. The small-sized breed is the most valuable, as these will thrive where the larger kind would starve. *Its diseases* generally arise from foul feeding and intemperance, such as measles, imposthumes, and scrofula. These are best prevented by keeping the animals (as the ancients strongly recommended), very clean in their styes; allowing them air, exercise, and a sufficiency of water.

AGRIMONIA (a corruption of the word

Argemone, by which name the ancients distinguished a plant reputed useful in cataract of the eye, which in Greek was termed *Argema*.

Class II. Ord. 2. Dodecandria. Digynia. Nat. Ord. *Rosacæ*.

The Characters are—*Calyx five toothed, surrounded by another; petals five; seeds two at the bottom of the calyx.*

1. *AGRIMONIA EUPATORIA* (common agrimonia) Curt. 5. 32. *Fruit hispid; cauline leaves pinnate with oblong ovate leaflets; spikes elevated; petals twice as long as calyx.*—Agrimony is a plant of very general growth, being found not only in Europe, but in Virginia and Japan. It has been chiefly regarded as a medicinal plant, and as such is often raised in gardens. Culture does not seem to produce any material change in its quality. It is perennial, and flowers in June and July. The root in spring is sweet-scented; an infusion of it is used by the Canadians with great success, in burning fevers; and Dr. Hill, says, that an infusion of six ounces of the crown of the root in a quart of boiling water, sweetened with honey, and drank, to the quantity of half a pint, three times a day, is an effectual cure for the jaundice. He recommends to begin with a vomit, to keep the bowels soluble, and to persist in the use of the medicine as long as any symptoms of the disease remain. The leaves have a slightly bitterish, roughish taste, accompanied with an agreeable though weak, aromatic flavour: the flowers have a stronger and more agreeable smell, resembling, when fresh gathered, that of apricots. They readily give out their virtues to water and rectified spirit: and in distillation with water, the leaves afford a yellowish essential oil, with the odour of the herb. This plant has been principally regarded as a mild astringent and corroborant, and many recommend it as a deobstruent, especially in hepatic and other visceral obstructions. Instances occur of its successful use in cases where the liver was much enlarged and indurated. It has been used with advantage in hæmorrhages, and for giving tone to a lax and weak state of the solids. In cutaneous disorders, particularly the scabies, it is said to have great efficacy: for which purpose it was given infused with liquorice in the form of tea; but, according to Alston,

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it should be always exhibited in the state of powder. The country people sometimes apply the leaves by way of cataplasm in contusions and fresh wounds. When the plant comes into flower, it will dye wool of a good bright full nankeen colour; and if gathered in September, it yields a darker yellow; and, for the purposes of the dyers, it deserves further trial. In the Berlin acts, it is recommended for dressing leather. Sheep and goats eat it: cows, horses, and swine, refuse it.

Of this species there are two varieties; viz.

1. *AGRIMONIA MINOR* (or white agrimony). It is smaller than the common sort, the leaves have not so many pinnæ, and the pinnæ are rounder, and the indentures on their edges blunter. It grows naturally in India, from whence I received the seeds, and have constantly found that the seeds of this when sown never vary.

2. *AGRIMONIA ODORATA* (or sweet scented agrimony). *Leaves pinnate, with oblong leaflets, the lower being short.*—The sweet-scented agrimony grows near four feet high; its leaves have more wings than the former; they are longer and narrower, and have sharper serratures; when handled they emit an agreeable odour. The infusion of the leaves is an agreeable cooling tea to persons in a fever. This is a native of Italy, and was cultivated here in 1640.

2. *AGRIMONIA REPENS* (creeping agrimony). *Fruit hispid; cauline leaves pinnate, with oblong leaflets; spikes subsessile; petals three times as long as calyx.*—This species is of humble growth; has longer and narrower pinnæ than the former, and the spikes of flowers are very short and thick. It multiplies faster than the common sort, and the seeds are much larger and rougher. It has been furnished from the Botanic Garden at Paris, whither it was sent by Mr. Tournefort, from Armenia, of which country it is a native, [and cultivated here by Mr. Miller, in 1739.]

3. *AGRIMONIA PARVIFLORA* (small flowered agrimony). *Fruit hispid; cauline leaves pinnate, with many lanceolate leaflets; petals half as long again as calyx.*—This species is a native of North America, and cultivated in 1766, by Mr. James Gordon.

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[4. *AGRIMONIA STRIATA* (white-flowered agrimony). *Spikes variegated; fruit reflexed, turbinate furrowed, crowned with hair.* A native of North America. Introduced 1812.]

5. *AGRIMONIA AGRIMONIDES*, *aremonia agrimonides*, D. C. Prod. p. 588. (Three-leaved agrimony), Col. ecp. 1. t. 144. *Fruit smooth; cauline leaves ternate; stamens usually eight.*—A native of Italy and Carniola, in moist woods and among bushes; [and was cultivated in 1739, by Miller]. It greatly resembles the other in the shape of its pinnæ (or smaller leaves), but there are but three upon each foot-stalk; the flower of this hath a double empalement, the outer one being fringed. There are but seven or eight stamina in each flower, and the seeds are smooth, for which reason, modern writers on botany have separated it from the *agrimonia*, making it a distinct genus under the name of *Aremonia*.

[6. *AGRIMONIA NEPALENSIS* (Nepaul agrimony). *Leaves interruptedly pinnate; leaflets ovate, serrated, odd one stalked, very villous on both surfaces, as well as the stems; bractæas trifid, shorter than the calyx; segments of the calyx, lanceolate, keeled, acute.*—We are informed by Mr. D. Don, in his valuable Prod. Fl. Nep. that this species is a native of Gossainathan, where it attains the height of two feet, flowering in June and July. Introduced in 1820.

7. *AGRIMONIA SAUVEOLENS* (pleasant scented agrimony). *Plants very hairy; leaves interruptedly pinnate; leaflets lanceolate, serrated; spikes of flowers twiggy and clammy; petals twice the length of the calyx.*—This species is a native of North America, from Virginia to Carolina. It is about two feet in height, flowering in July and August. Introduced 1810.

8. *AGRIMONIA DAHURICA* (Dahurian agrimony). *Glabrous; leaves interruptedly pinnate.*—This species, which very much resembles the *A. Eupatoria*, is a native of Dahuria. It differs in the flowers being more remote, and in the leaves being narrower and sharper. Flowers in June and July. Is from one to two feet in height. Introduced 1811.

9. *AGRIMONIA BLUMEI* (Blume's agrimony). *Racemes elongated, clothed with*

clammy pubescence; leaves interruptedly pinnate, clothed with a velvety pubescence. A native of the mountains of Java and Japan.]

These plants are hardy and perennial, and will thrive in almost any soil or situation, and require no other care than keeping them clear from weeds. They may be propagated by parting of their roots (which should be done in autumn, when their leaves begin to decay, that the plants may be well established before the spring), and planting them at a distance of at least two feet, that their roots may have room to spread. They may also be propagated by seeds, which should be sown in autumn, for if they are kept out of the ground till spring, they seldom come up the same season.

AGROSTEMMA, *Αγρου στήμμα*, (the garland of the field.

Class 10. 4. Decandria Pentagynia. Nat. Ord. *Caryophylleæ*.

The characters are—the *calyx*, a one-leaved, coriaceous, or leather-like, tubulous, fire-toothed, permanent perianthium; the *corolla* has five petals, with claws of the length of the tube of the calyx, and border spreading, obtuse and undivided; the *stamina* are ten awl-shaped filaments, five alternately later than the other five, inserted into each claw of the petals, the anthers simple. the *pistillum* an ovate germ, with filiform, erect styles, of the length of the *stamina*, and simple stigmas; the *pericarpium* an oblong-ovate, covered, one-celled, five-valved capsule; the seeds very numerous, kidney-shaped, and dotted.

[1. *AGROSTEMMA GITCHAGO*, *Githago segetum*, Desf. Cat. p. 159. (Corn cockle, or rose campion). Eng. Bot. 741. *Plant hairy; stem dichotomous; flowers on long stalks; leaves linear.*—The beauty of the flowers of the common cockle-weed well entitle it to the distinction of garland or crown of the fields.

The githago (*git* or *gith* was the name of certain black and aromatic grains, supposed to have been the *Nigella, saliva*, which were much employed by the Romans in cookery. The seeds of the plant githago are externally similar) is an ornamental weed, and along with corn, poppy, and blue bottle, makes a fine appearance in the fields of the slovenly husbandmen, where the

soil is dry and gravelly. This plant has not a crowned corolla, or blossom, as the others have, and flowers in June or July. A miller informed me, he never wished to see any of it among the corn he ground, as it had a very great tendency to clog his millstones. The seeds are black, with a surface like shagreen, and appear in the microscope, like a hedge-hog rolled up. They are large and mealy, and afford food to several sorts of birds. Its medicinal virtues, highly extolled by former writers, are disregarded in the present practice.

The seeds of this species require only to be sown in the open border in spring, in patches where they are intended to remain.]

2. AGROSTEMMA CORONARIA (common rose campion). Bot. Mag. 24. *Downy; stem dichotomous; peduncles long, one-flowered; calyx campanulate ribbed.*—This species is biennial, a native of Italy, the Valais, and Siberia; but so long an inhabitant of English gardens, that it is become a kind of weed. Of this plant there are three varieties, one with deep red, another with flesh-coloured, and a third with white flowers; but they are not much esteemed, as the double rose campion, which is a fine flower, has excluded the others from most good gardens. The single rose campions are sufficiently propagated by their self-sown seeds. The variety with double flowers, having no seeds, is propagated by parting the roots in autumn, and planting them in a border of fresh undunged earth, at the distance of about six inches; they should be watered gently till they have taken root: afterwards wet, as well as dung, is injurious to them. In spring they should be removed into the borders of the flower-garden, where they will be very ornamental, while they flower in July and August.

3. AGROSTEMMA FLOS JOVIS, *Lychnis flos jovis*, Don. M. G. D. vol. i. 415. (Flower of Jove, or umbelled rose campion). Bot. Mag. 398. *Downy; flowers in umbelate heads; calyx cylindrical, clavate ribbed.*—From the high flown epithet of *flos jovis*, bestowed on this species of *agrostemma* by some of the old botanists, one would be led to conclude that the plant must be one of a superior order, and superlatively beautiful: such, however, it is not;

yet it is sufficiently ornamental to merit a place in every flower-garden, and into which it has been very generally introduced. It grows naturally on the Swiss and Piedmontese Mountains, and in the Palatinate [and was cultivated in 1739, by Mr. Miller]. Flowers in July, and the seeds ripen in September. Will thrive best in a moist soil and shady situation.

4. AGROSTEMMA NICÆENSIS, *Githago nicæensis*, Don. M. G. D. vol. i. p. 417. (Nice rose campion). *Plant hairy; stem dichotomous; flowers on long peduncles; calyx longer than the corolla.*—This species, whose flowers are white, sometimes streaked with red, is a native in fields about Nice, where it produces its elegant looking flowers from June to August. The seeds only require to be sown in the open border in spring, in patches where they are to remain.

5. AGROSTEMMA CÆLIA-ROSE (smooth-leaved rose campion). Bot. Mag. 295. *Smooth; stem dichotomous, panicled, erect; flowers terminal, solitary.*—Mr. Aiton informs us, in his *Hortus Kewensis*, that this charming annual, the liveliness of whose colours no paint can express, was cultivated by Miller in 1739; seeing it is a plant of such beauty, and honoured with so distinguished an appellation, it is singular that it should not by this time have made its way more generally into our gardens. While the present species is much smaller than the *githago*, its flowers are proportionably larger, and their colours more vivid. It appears to most advantage when several plants of it grow together; the best mode, therefore, is to sow about a dozen seeds early in April on the several spots of the flower-border where you intend they shall remain; no other care is necessary than to keep the plants free from weeds and vermin. It is a native of Italy, Sicily, and the Levant.

[6. AGROSTEMMA APETALA (apetalous rose campion). Lin. fl. lap. t. 12. f. 1. (Under *Lychnis*). *Stem straight, one-flowered; leaves linear, lower ones spatulate; flower nodding; calyx inflated, bladdery, striated, hairy; petals shorter than the calyx.*—According to Linnæus this species is a native of the Alps of Lapland and Siberia; flowering in June and July. There are several varieties of this species, in some of which the

flowers are white, in others they are a deep red. Introduced 1810.

7. *AGROSTEMMA SYLVESTRIS* (red-flowered rose campion). Eng. Bot. 1579. (Under *Lychnis*). *Root perennial, tapering, herb clothed with fine soft prominent hairs, and somewhat viscid; leaves ovate; flowers dichotomously-panicled, generally dioecious; petals cloven; lobes narrow diverging capsule roundish, one-celled.*—The red campion is common under hedges and in other shady and moist places, flowering copiously in the spring, and occasionally, when it has been accidentally cropped at an early period, its flowers are observable here and there throughout the summer. They are often seen double in gardens. There is a pale variety in which the stamina and pistilla are sometimes, not always, together in the same flower.

8. *AGROSTEMMA DIOICA* (Dioecious rose campion). Eng. Bot. 1580. (Under *Lychnis*). *Hairy and viscid; leaves rather more lanceolate than ovate; petals cloven; lobes broad, approximating; capsules conical, with erect teeth.*—This species is no less common than the *sylvestris*, but differs from it in place of growth, being found in rather more exposed situations, principally open fields; flowering in June and July. The whole plant is firmer and taller than the foregoing. Flowers larger; white, sometimes pale blush coloured, diffusing a delicate sweet fragrance in an evening, or before rain; but we do not find them, according to Dr. Sibthorp's account, expanded more particularly at that time, nor do the differences indicated by that indefatigable botanist in the shape of the fruit appear constant to us. There is also a variety of the species with green flowers.

9. *AGROSTEMMA FLOS-CUCULI* (cuckoo flower, or ragged robin). Eng. Bot. 537. (Under *Lychnis*). *Stems ascending, smoothish; leaves united at their insertion; lanceolates entire, nearly smooth; calyx campanulate, with ten ribs; petals torn, appendiculate capsule of a roundish cylindrical figure with but one cell; seeds numerous, each standing on a little footstalk, round a central receptacle.*—Frequent in moist meadows, flowering early in June, when its pretty delicate petals are seen quivering to every breeze; but the mower's scythe soon levels them in the undistinguished heap

of meadow hay. A variety with double flowers, whose petals are extremely numerous and thickly set, is common in gardens, and the flowers are said to be sometimes found white.

10. *AGROSTEMMA LETA* (joyful rose campion). Brot. fl. lus. 2. p. 221. Phyt. lus. fas. 1. (Under *Lychnis Palustris*). *Leaves linear-lanceolate, rather ciliated; calyxes with ten ribs; petals bifid.*—This species is a very pretty little plant with rose coloured flowers. Native of Portugal, in bogs and moist meadows; flowering in July. Introduced 1778.

11. *AGROSTEMMA PYRENAICA* (Pyrenean rose campion). *Leaves leathery, radical ones spatulate, on long footstalks, cauline ones cordate, sessile; flowers in dichotomous bundles, with a single flower in each fork, which stands on a long peduncle.*—This species, producing its red or white flowers in June or July, is a native of the Pyrenees, on rocks, and was introduced into this country in 1819. It grows from three to six inches in height.

12. *AGROSTEMMA SIBIRICA* (Siberian rose campion). *Leaves linear, and are as well as the tufted stems hairy; calyx campanulately globose; lobes very short, obtuse.*—A native of Siberia. The flowers (which are of a pink colour) are produced in bundles, and solitary in the stalks of the stem in June and July. Introduced 1817.

The following species are not as yet introduced into this country:—

13. *AGROSTEMMA DECLINIS*, (declining rose campion). *Leaves, ovate lanceolate; flowers dioecious, on long pedicels, terminal and axillary.*—A plant 18 inches high, with white or red flowers. Flowering in June or July. Native of the province of Valencia in Spain.

14. *AGROSTEMMA VARIEGATA* (variegated rose campion). Desf. cor. Tournef. 74. t. 56. *leaves roundish, fleshy, glaucous; footstalks connate at base.*—A native on Mount Ida, with variegated flowers. The plant is about 6 inches in height.

15. *AGROSTEMMA NIVALIS* (snow rose campion). *Radical leaves oblong, ciliated tapering into the petiole; scape one flowered; bracteas elongated, linear, ciliated.*—From the Carpathian Mountains. It is of the same size as the *variegata*.

16. *AGROSTEMMA TRIFLORA* (three-

flowered rose campion). *Stem erect, very short, pubescent; leaves densely pubescent, radical ones crowded, lanceolate, acutish, ciliated, entire, with a pair of cauline ones hardly an inch from the root.*—The flowers are erect, and white. The two lateral ones are on short pedicels, the middle one on a longer. Native of Greenland.

17. *AGROSTEMMA PULCHRA* (fair rose campion). Schlecht et Cham. in *Linnaea*. 5. p. 334. under *Lychinis pulchra*.—*Herbaceous, canescent, viscidly pubescent; stem erect, few flowered; leaves lanceolate, acute, lower one tapering into the petiole, upper ones sessile, half-stem clasping.* A plant two feet high, with red flowers, on long peduncles, like those of the *syvestris*; but nearly twice the size. It is a native of Mexico, at the bottom of Mount Orizaba.]

AGROSTIS (formed from *αγρος*, a field).

Class 3. 2. Triandria Digynia. Nat. Ord. Gramina, or grasses.

The characters are—*The calyx is a one-flowered, bivalve, acuminate glume, or husk tapering to a point; the corolla, bivalve and acuminate, with one valve larger than the other; the stamina have three filaments longer than the corolla, with forked anthers; the pistillum is a roundish germ with two reflex villous styles and stigmas longitudinally hispid (or as Dr. Smith says), plumose; the pericarpium is a corolla growing to the seed, not gaping; the seed is roundish, pointed at both ends, with the corolla adhering closely to it.*

Professor Martyn enumerates 35 species, and Gmelin 42 species. They are distributed into two classes; the *Aristatæ*, or those with awns, and the *Muticæ* or naked, without awns.

AWNED.

1. *AGROSTIS SPICA VENTI* (silky bent grass), *with entire petals, the outer petal having a stiff, straight, and very long awn, and the panicle spreading.*—An annual, common in sandy cornfields, and flowers in June and July. It is liable to be smutted. Horses and goats eat it, but sheep refuse it.

2. *AGROSTIS INTERRUPTA* (interrupted spike bent grass), *with bifid petals, the outer awned, the panicle attenuated, contracted and interrupted.*—According to Haller, this is a variety of the former: it is annual, and a native of France,

Italy, Switzerland, Carniola, and Germany.

3. *AGROSTIS MILIACEA* (millet bent grass), *with the outer petal terminating in a stiff, straight awn of a moderate length.*—A native of Montpellier, Spain, and Siberia, was introduced by M. Thouin, in 1778, and resembles the first.

4. *AGROSTIS BROMOIDES*, *with a simple narrowed panicle, pubescent corolla, and awn straight, longer than the calyx.*—This species is perennial and grows wild about Montpellier.

5. *AGROSTIS AUSTRALIS* (southern bent grass), *with the panicle approaching to a spike; the seed ovate and pubescent, and awn of the length of the calyx.*—A native of Portugal.

6. *AGROSTIS ARUNDICEA* (reedy bent grass), *with oblong panicle; outer petal, villous at the base, and furnished with a writhed awn, longer than the calyx.*—Haller and Scopoli rank this species among the *arundines*. It is a native of many parts of Europe, and is perennial. The Kalmuck Tartars weave mats of it, and thatch their houses with it. Goats, it is said, will rather die of hunger than eat of this grass.

7. *AGROSTIS CALAMAGROSTIS* (branching bent grass). *Panicle thickened; the whole of the outer petal woolly, awned at the tip, and branching culm.*—This resembles the former; is perennial and a native of Germany, Switzerland, and about Verona.

8. *AGROSTIS SEROTINA* (late bent grass), *with oblong mucronate floscules, and culm covered with very short leaves.*—This species was observed by Seguiet, near Verona.

9. *AGROSTIS RUBRA* (red bent grass), *with the flowering part of the panicle very spreading; outer petal smooth, awn terminal, spiral and recurved.*—Is very common in Sweden, and is found also in Scotland, in low pastures.

10. *AGROSTIS SPICIFORMIS* (spiky bent grass), *with the panicle resembling a spike, two-awned flowers, one awn inserted into the receptacle, jointed and longer than the other, which is straight, and inserted below the tip of the corolla, which is rough.*

11. *AGROSTIS HIRSUTA* (hairy bent grass), *with the panicle approaching to a spike, culm and leaves hirsute; glumes of the corolla awned on the back, and bifid at the tip.*—These two species

were found in the Island of Teneriffe, by Masson.

12. *AGROSTIS MATRELLA*, with the flowers in racemes; outer valve of the calyx bent in, and the tip of the keel only gaping.—Is found in the sandy lands of Malabar.

13. *AGROSTIS CANINA* (brown bent grass), with ovate coloured calyx, naked corolla, an incurved horn on the back of the petals, and prostrate culms a little branching.—There are two varieties of this species, the rough and the smooth, which Dr. Stokes, in *Withering's Arrangement*, makes a distinct species under the name of *A. alpina*, and so classed by Gmelin; this is found plentiful in the higher downs in Dorsetshire and the higher parts in the New Forest of Hants, and flowers in May and June. But Dr. Smith refers the *A. canina* (α) of Hudson, to the species of *A. canina* and also the *A. vinealis* of Withering; and says it is perennial, flowering in July, and found in meadows and moist pastures; and the *A. canina* (β and γ) of Hudson, and *A. alpina* of Withering, above described, to a distinct species, viz.—

AGROSTIS SETACEA (bristly bent grass), with lanceolate calyces and corolla awned at the base; the awn graniculated, and the radical leaves setaceous.—It is perennial, flowering in July and August, and found on dry heaths, frequently in the West of England, and on the sea-coast near Weymouth.

To the class of awned *Agrostis*, Gmelin refers the following species, viz.—*A. VINEALIS* and *A. CINNA*, of Martyn, *A. ALPINA*, with setaceous leaves, compact panicle, rough and coloured calyx, and exterior petal with a jointed awn in its back. *A. LAEVSII*, with elongated calyces, awn of the petals recurved at the back, and prostrate culms with four branches. *A. GIGANTEA*, with the upper part of the panicle first flowering very wide, rough calyces, the exterior petal smooth, the back slightly awned above, and an erect culm. *A. DUBIA*, with equal smooth calyces; corolla mucronated below the apex, and setaceous leaves. *A. FESTUCOIDES* with setaceous leaves, spreading panicle, and petals with awn bent in at the base twice as long as the calyces. *A. FILIFORMIS*, with filiform leaves and culms, approximate panicle, and smooth floscules awned at the base.

AWNLESS.

14. *AGROSTIS STOLONIFERA* (creeping or black squitch). Eng. Bot. 1532. Branches of the panicle spreading; culm naked, creeping; calyces equal. Dr. Smith describes this species as having a compact panicle, ramose creeping culm, congested flowers, and calyces equal, lanceolate and pubescent.—It is perennial, a native of most parts of Europe, and found in moist meadows and pastures, and also in stiff cold arable lands, where it is very troublesome; for when such lands are broken up and fallowed, the roots are separated with difficulty from the adhesive sod. Hudson joins his species with the *capillaris*, *pumila*, *alba*, and *sylvatica*, under the name of *polymorpha*; and Gmelin queries whether these and also the *virginica* are not varieties of the same species, owing their difference merely to the soil; some have supposed that this is the famous ORCHESTON GRASS.

15. *AGROSTIS CAPILLARIS* (fine bent grass). Panicle capillary, spreading, flexuose, and calyces equal, subulate smooth (slightly roughish, Gmel.) coloured.—Is very common on poor, dry, and sandy land, and is disliked by cattle, as are the bents in general; it flowers in May and July. Gmelin queries whether it be not a species of *Alopecurus*. Some have supposed that the *A. capillaris* of Linneus, is the same with the *Agrostis vulgaris*. Linneus confounded these two plants; but the error was discovered by Dr. Smith. In general habit, says Withering, the plants are very much alike; but the real *A. capillaris* has the stem, leaves and husks of the calyx quite smooth, as well as every other part of the plant, whilst in the *A. vulgaris* the stem leaves are rough, and the husks of the calyx are serrulated on the keel, as they are in every other British species of *agrostis* except the *minima*. Again, in the *capillaris*, the valves of the blossoms are equal, but in the *A. vulgaris* the inner valve is only half the size of the other.

16. *AGROSTIS VULGARIS* (fine bent grass). Eng. Bot. 1671. Branches of panicle smoothish; branchlets at the time of flowering divaricating; ligula very short truncated; florets numerous; calyx inner valve smooth, outer serrulated upwards; blossom inner valve but half the size of the other.—This grass, common

in July and August in pastures, fields, and on banks by road sides; was always taken for *A. capillaris* of Linnæus, till his *Herbarium* came amongst us, see Pl. H. exerb. Linn. t. 24, where the true plant of that name is figured.

The root of *A. vulgaris* is perennial and somewhat creeping; stem erect, smooth, slender, leafy. Leaves narrow, acute, roughish, with long sheaths; stipula short and blunt; panicle upright, purplish, well known by its very numerous, spreading, capillary, zig-zag branches, variously forked and subdivided, and its little ovate shining flowers; Calyx valves nearly equal, lanceolate, rather acute, concave, with a membranous edge. Petals very thin, greenish, white, the outermost scarcely so long as the calyx, the other but half as long.

The larger petal has sometimes a dorsal awn, when the plant becomes *A. canina* of Withering (not Linnæus). When dwarf it is *A. pumila* of authors, and in that state varies with or without an awn. Sometimes the corolla is elongated after flowering, as in *A. ALBA*.

17. *AGROSTIS SYLVATICA* (wood bent). *Panicle contracted; calyces equal, those of the barren flowers shorter than the corolla, and those of the fertile ones twice as long.*—This species is perennial, and grows in moistish woods, as Bishop's wood, Hampstead, and also in Hornsey wood, near London. It flowers in June and August.

18. *AGROSTIS ALBA* (white bent grass). *Panicle loose, calyces equal, and culms creeping.*—A perennial, growing in ditches, marshes, and moist meadows. Withering mentions four varieties; one with panicle branches, crowded with florets at the base, which flowers in June and July, and is found in wet ditches, bogs, and marshes; a second, with calyx, both valves serrulated, supposed to be the preceding plant, when growing in a drier situation, and found amongst wheat, in light sandy loam, flowering from July to September; a third, with the inner valve of the calyx only serrulated upward, found in loamy soil, amongst wheat, and in very light sandy soil under the Norfolk course of turnip husbandry, and also elsewhere amongst potatoes, flowering from July to September; the fourth has both valves of the calyx serrulated, the inner

only on the upper half: it is found amongst wheat, in light land, flowering from July to September. The three last varieties constitute the greatest part of what is called squitch, in light arable lands; which are called white squitch, to distinguish it from *A. nigra* and *A. stolonifera*, which are called black squitch, or couch. Dr. Smith enumerates only two varieties, viz. the *A. alba* and *A. sylvatica*, i. e. marsh and wood B. which he refers to this same species.

19. *AGROSTIS PUMILA* (dwarf bent grass). *Panicle on one side; culms erect in bunches.*—A native of Iceland, Sweden, Germany, Switzerland, England in sundry places, Wales, and Scotland; found in poor barren soil, e. g. heaths near Harrowgate, perennial, and flowering in July.

20. *AGROSTIS MINIMA* (least bent grass). *Panicle filiform; flowers elliptic, retuse, and awnless; corolla villose.*—Is a native of France and Germany, and has been discovered by Mr. Stillingfleet, in Wales; it is common in sandy pastures, on the south-west coast of Anglesea. By some it is denominated spring-crab, and said to flower early in March and April, and ripen its seed in May. Dr. Stokes refers this species to the Poa.

21. *AGROSTIS TENACISSIMA* (tough bent grass). *Panicle contracted, filiform; flowers linear, and valves parallel.*—It is perennial, and a native of the East Indies.

22. *AGROSTIS VIRGINICA* (Virginian bent grass). *Panicle contracted; leaves rolled inwards, subulate, rigid, standing out.*—An elegant little plant, called by Browne crab-grass. The stalk is somewhat compressed, seldom rising above four or five inches from the root.

23. *AGROSTIS MEXICANA* (Mexican bent grass). *Panicle oblong heaped; calyces and corolla acuminate and nearly equal.*—A native of South America, flowering the second year, having the appearance of cinna, and introduced in 1780 by Mr. G. Alexander.

24. *AGROSTIS PURPURASCENS* (purple bent grass). *Panicle contracted, elongate; branches pressed close upright; and florets unequal, and acuminate.*—A native of Jamaica.

25. *AGROSTIS INDICA* (Indian bent grass). *Panicle contracted; racemes*

lateral, erect, alternate.—A native of India, introduced in 1773 by the Earl of Bute.

26. *AGROSTIS CILIATA* (ciliate bent grass). *Glumes of the calyx angular and ciliate*.—A native of Japan.

27. *AGROSTIS PANICEA* (bearded bent grass). *Panicle subspiked; branches and branchlets fascicled; valves of the calyx and one of the corolla awned, that of the corolla very short*.—Comprehends the *paniceus* and *monspeliensis* *ALOPECURUS* in the Linnæan system: the first grows in marshes and wet pastures, and the second in a dry soil, to which the difference is probably owing.

28. *AGROSTIS LENTA* (forked bent grass). *Spikes subtern, umbellate; floscules awnless, oblong, acute; calycine valves subequal, leaves and sheaths smooth*.—A native of the East Indies, found there by Dr. Koenig, and introduced in 1778 by Sir Joseph Banks. It is an annual, and flowers in July and August.

29. *AGROSTIS COMPLANATA* (flat-stalked bent grass). *Spikes umbelled, smooth; outer calycine valves awned; flattened leaves and smooth sheaths*.—A perennial, native of Jamaica, flowering in July and August: introduced in 1773.

30. *AGROSTIS PUNGENS* (prickly bent grass). *Panicle contracted; leaves involute, stiff, pungent, the upper ones obliquely opposite; and branching culm*.—A native of Arabia and Barbary; also found in dry places near the coast of the country of Nice. It is perennial, and used by the Arabs in the hæmorrhoids.

31. *AGROSTIS VINEALIS* (short-awned bent grass). *Culms ascending; calyx coloured; awn nearly straight, from below the middle of the back, about as long as the calyx*.—Is a native of Switzerland and the north of England, found on heaths, meadows, and moist pastures, which have been long in turf. Some parts of Hounslow heath abound with it. Dr. Smith refers the *A. vinealis* of Withering to the *A. canina*.

32. *AGROSTIS ODORATA* (sweet bent grass). *Having spikes, with the florets pointing one way, heaped together, awnless*.—A native of Cochin China, near the coast, where it is dried, and used for perfuming their clothes.

33. *AGROSTIS PLICATA* (plaited-leaved bent grass). *Leaves plaited,*

spike linear, awnless.—A native of the suburbs of Canton.

34. *AGROSTIS CINNA*. *Panicle contracted, awnless; flowers acuminate, with one, two, or three stamens; leaves flat, scabrous*.

35. *AGROSTIS DIANDRA*. *Panicle elongate, contracted; flowers subulate, awnless, diandrous or two-staminate; and convolute leaves*.

These two species have been referred by some to *CINNA*.

Dr. Withering mentions some others as species, viz.

AGROSTIS PALUSTRIS, with the husks of the calyx equal, and the outer valve of the blossom twice the length and breadth of the inner; awn straight, much shorter than the blossom, fixed a little beneath its point.—Some consider this as an awned variety of the *A. alba palustris* of Hudson, but Dr. W. regards it as a distinct species. It is found in swamps and moist ditches; perennial, and flowering in June and July.

AGROSTIS PALLIDA, with the valves of the calyx unequal; the inner valve of the blossom hair-like, very short, and somewhat longer than the blossoms fixed below its middle.—It is sufficiently distinct from both the *A. alba* and the *A. capillaris*. Found in the New Forest, Hants; and flowering in May and June.

AGROSTIS LITTORALIS (sea-side bent grass). Eng. Bot. 1261. *With panicle somewhat spike-like; the husks of the calyx awned*.—First found on the Norfolk coast by Sir Joseph Banks. Perennial, flowering in June. The *A. littoralis*, according to Dr. Smith, has linear lanceolate-awned calyces, naked corolla, awn sub-terminal straight, and decumbent culms. It is perennial, flowers in August, and is found in clayey sea-shores, and in salt marshes near Clay, Norfolk.

AGROSTIS NIGRA, with scattered panicle; branches bare at the base; florets few; inner valve of the calyx smooth; and creeping root.—It is different from the *A. stolonifera* of Linnæus, to which some have referred it. Found in marley, clayey, and other cold wet soil, both in grass, and under tillage. Perennial, flowering from July to October.

AGROSTIS MARITIMA, with large, rather spreading panicle; longer branches naked, shorter ones crowded with florets at the base; inner valve of the

calyx smooth, outer serrulated upwards. Gathered by Dr. Pulteney in the sand on our southern sea-coasts. Perennial, flowering in June and July.

Gmelin has omitted some of the preceding awnless species, and added the following, viz.

AGROSTIS VERTICILLATA, with straight panicle, interrupted by radiated rigid verticilli or whorls.

AGROSTIS STRICTA, with stiff panicle, having flowers, and an erect culm.

AGROSTIS LINEARIS, with subquatern digitated spikes, and adpressed alternate, unilateral floscules.

AGROSTIS PROCERA, with the foot-stalks of the panicle racemose and somewhat erect, and the flowers hairy and lanceolate.

AGROSTIS COROMANDELIANA, with the panicle ovate, patent; the foot-stalks simple; second flowers, and equal, acute, glossy calyces.

AGROSTIS ASPERA, with contracted panicle; lateral, alternate, stiff racemes; and rough leaves.

AGROSTIS AVENACEA, with an erect, very slender panicle, and the awns twice longer than the calyx.

AGROSTIS GLOMERATA, with bifid, glomerate, terminal spikes, and clawed plumose bractæe.

AGROSTIS LATERALIS, with bifid, lateral, solitary spikes, and clawed plumose bractæe.

Dr. Stokes has observed that this is an artificial genus, and that the species which are chiefly distinguished by the presence or absence of the awn in the corolla, and which is inconstant, are not precisely ascertained. He therefore recommends particular attention to the open or closed state in which the valves of the calyx are found, immediately after the shedding of the pollen, and the ripening of the seed; and likewise to the flowers, whether they are scattered or clustered.

Mr. Brown, in his valuable *Prod. Nov. Holl.*, has arranged and described fourteen species (all natives of New Holland or Van Dieman's Island), viz.

1. *Perianthium sessile, muticum, basi imberbe.*

AGROSTIS PARVIFLORA. *Paniculâ effusâ capillari, glumis æqualibus perianthii valvulâ exteriori truncatâ: interiore minutissimâ.*

2. *Perianthium pedicellatum, pedicello barbatâ aristâ dorsali, panicula coarctata.*

AGROSTIS CRINITA. *Monandra, paniculâ elongatâ, glumis longè acuminatis, perianthii valvulis exterioribus glumâ ½ brevioribus: aristâ dorsali sexies longiore, vaginis scabriusculis.*—Labill. Nov. Holl. 2, p. 115, t. 263.

AGROSTIS SCIUREA. *Monandra, paniculâ elongatâ, glumis acuminatis, valvulâ exteriori perianthii emarginatâ minorem glumæ æquante; aristâ dorsali valvulâ quadruplo longiore, vaginis lævibus.*

AGROSTIS RARA. *Monandra, paniculâ subcoarctatâ: ramis paucifloris, perianthii valvulâ exteriori glumam æquante juxta apicem aristâ flexuosâ longissimâ, vaginis scabriusculis.*

AGROSTIS QUADRISETA. *Triandra, paniculâ, cylindraceâ: ramis ramulisque imbricatis, glumis acuminatis, valvulâ exteriori perianthii glabrâ: aristâ infra medium dorsi glumis duplo longiore: apice quadridentatâ dentibus setaceis interioribus brevioribus.*—Labill. Nov. Holl. 1, p. 25, t. 32.

AGROSTIS CYLINDRICA. *Triandra, paniculâ cylindraceâ: ramis imbricatis, glumis subacuminatis, valvulâ exteriori perianthii obtusiusculâ subintegrâ juxta basin aristâ glumis parâ longiore, foliis planis.*

AGROSTIS MONTANA. *Triandra, paniculâ subcylindraceâ: ramis imbricatis, glumis acuminatis coloratis, valvulâ exteriori perianthii pubescenti scabriusculâ: apice bidentatâ infra medium aristatâ, foliis involuto-setaceis.*

AGROSTIS LOBATA. *Triandra, paniculatâ subspicatâ decompositâ lobatâ: ramis ramulisque imbricatis glumis acuminatis, valvulâ exteriori perianthii scabriusculâ: apice 4 dentatâ subæquali; juxta basin aristatâ.*

3. *Perianthium sessile, basi barbatâ aristâ strictâ e divisurâ apicis. Panicula coarctata.*

AGROSTIS OVATA. *Paniculâ ovatâ v. oblongâ spiciformi, aristâ glumis longiore, setulâ ad basin valvulæ interioris.*—Labell. Nov. Holl. 1, p. 19, t. 21, bona.

4. *Perianthium basi extusve barbatum, aristâ dorsali panicula effusa.*

AGROSTIS BILLARDIERI. *Paniculâ capillari, glumarum carinis denticulatis, valvulâ exteriori perianthii glabrâ bimucronatâ: aristâ dorsali glumis longiore, setulâ villosâ ad basin valvulæ interioris, foliis planis.*—Labell. Nov. Holl. 1, p. 24, t. 31.

AGROSTIS ÆMULA. *Paniculâ, capillari, glumarum carinis denticulatis, valvulâ exteriore perianthii longitudinaliter pubescenti bimucronatâ: aristâ dorsali glumis duplo longiore, setulâ villosâ ad basin valvulæ interioris, foliis planis.*

AGROSTIS SCABRA. *Paniculâ capillari, glumarum carinis lateribusque scabris, valvulâ exteriore perianthii glabra: apice denticulatâ; aristâ dorsali inclusâ, setulâ villosâ ad basin interioris, foliis planis vaginisque scabris.*

AGROSTIS PLEBEIA. *Paniculâ capillari, glumarum carinis nudiusculis, valvulâ exteriore perianthii longitudinaliter pubescente: apice biaristatâ; basi aristâ glumis duplo longiore, foliis substœcatis.*

AGROSTIS DECIPIENS. *Paniculâ lazâ subnutante glumis acutis, valvulâ exteriore perianthii 5 nervi: aristâ dorsali brevissimâ foliis involutis.*

Of this genus, the most remarkable species is the *A. stolonifera* or *fioren*, so much recommended by Dr. Richardson; but respecting which, the opinion of practical men is still unsettled, and on the whole, rather unfavourable than otherwise. It seems to suit the climate of Ireland, and to be more productive and nutritive there than any where else. In the account of the Woburn experiments on grasses, it is observed of *fioren*, that it appears to possess "merits well worthy of attention, though, perhaps, not so great as has been supposed, if the natural place of its growth and habits be impartially taken into the account." It is called *squitch*, *quick*, &c. like the common couch grass, from the length of time it retains its vital powers. Like other plants, which propagate themselves abundantly by extension of their parts, it rarely bears seeds, and is therefore propagated by cuttings of the stems laid along drills an inch deep, and slightly covered with soil. *A. vulgaris*, which in dry arable land is called the *black squitch*, is the most common and earliest of the bents, but inferior to several in produce, and the quantity of nutritive matter it affords. The bents are generally rejected by the agriculturist, on account of their lateness of flowering; but this circumstance, as Sinclair observes (*Davy's Agr. Chem.*) does not always imply a proportional lateness of foliage. *A. vulgaris* is in

leaf by the middle of April. *A. stolonifera* is two weeks later, and *A. nivea* and *repens*, three weeks later. In the South of France and Italy, the poor people collect the *stolons* of different species of *agrostis* by the road sides and hedges, and expose them for sale in the market places in small bundles as food for horses.

AGYNEIA. (*a priv.* and *γυν*, a wife.)

Class 21, II. Monœcia Monadelphica. Nat. Ord. of *Tricoccæ*. *Euphorbiæ*. Juss.

The characters are—*Calyx*, six leaved; *Corolla*, none; MALE, *anthers three*, growing to the rudiment of a style; FEMALE, *germ perforated at top, without style or stigma*.

1. AGYNEIA IMPUBES. *Leaves smooth on both sides.*—An erect shrub, with the last branches rather downy. Leaves alternate in two rows, subpetiolate, elliptic, quite entire, an inch long, glaucous and veined underneath. Flowers axillary, many, close, peduncles one-flowered, very slender, the length of the flower. Male flowers small and smooth; female larger with downy peduncles.

2. AGYNEIA PUBERA. *Leaves downy underneath.*—A shrub rather erect, with pubescent branches. Leaves alternate in two rows, subpetiolate, oval-oblong, obtuse, quite entire, an inch and half long. Flowers as in the former; but the appearance very different.

Both are natives of China.]

AILANTUS (from the Amboyna name *Ailanto*, the name of one species in the Moluccas. The usual way of writing it *Ailanthus*, is therefore incorrect).

Class 23, 1. Polygamia Monœcia.

22, 9. Diœcia Decandria. Schreb. Nat. Ord. *Terebinthacæ*.

The characters are—MALE, *calyx five parted; corolla, five-petalled; stamina, ten*. FEMALE, *calyx and corolla as in the male; Germs, three-five; styles, lateral; pericarp, membranaceous, one-seeded*. HERMAPHRODITE, *calyx and corolla as in the male; stamina two-three*.

1. AILANTUS GLANDULOSA (tall or Chinese *Ailantus*). *Wats. Dend. Britt. 104.* *Leaves pinnated with an odd one; leaflets toothed at base; teeth glandular.*—This tree rises with a straight trunk to the height of forty or fifty feet; the bark is gray, slightly furrowed, and has white marks on it; the young twigs are covered with a fine

velvet down. Leaves large, smooth, alternate, unequally pinnate, disposed horizontally. The common petioles form an angle more or less acute, or sometimes a right one with the branch: they are slender, from one to two feet in length. Leaflets from twenty to thirty, alternate and opposite, from two to three inches in length, and from one to two in breadth, on a short petiole; laterally towards the base are some blunt teeth glandulose beneath; the rest of the leaflet is commonly entire. Flowers very numerous in a close terminating panicle, usually in groups on a common peduncle, and each flower on its proper pedicle: they are male and female, with a few hermaphrodites; the males are the most numerous. They exhale a disagreeable odour.

The *ailantus* grows very fast in our climate, and being a handsome tree rising to a considerable height, is proper for ornamental plantations. If the bark be wounded, a resinous juice flows out, which hardens in a few days. The wood is hard, heavy, glossy, like satin, and susceptible of a very fine polish.

[Before the fructification was known, this tree passed for a species of *Rhus*; and it is memorable among us for the dispute it occasioned between Mr. Ellis and Mr. Miller, which is recorded in the *Philosophical Transactions*, 42, 870. The latter contended that this tree was the *Fusi-no-ki*, or spurious varnish-tree of the Japonese: but it is clear that he was mistaken; for the leaves of that tree are entire, and have none of those singular glands which are found in this; nor does the *ailantus* yield any juice.

It is a native of China; and was first raised in England by Mr. Miller and Philip Carteret Webb, Esq. about the year 1751, from seeds sent over by Father D'Incarville.] With us it has hitherto produced only male flowers; at Paris and Leyden it has born female flowers and fruit, but the fruit has not ripened. Some years it bears only male flowers; but about twice in ten years it has both male and female flowers, in France. It will grow on very poor soil, especially if it be calcareous.

[2. *AILANTUS EXCELSA* (Indian *Ailantus*). Rox. cor. 1. t. 23. *Leaves abruptly pinnated, leaflets serrated.*—This is an immense large tree, with a trunk

perfectly straight, rising like that of the fir-tree, to a very great height; is found in many parts of the Circars, but is chiefly a native of the open valleys among the mountains; flowers during the cold season; seed ripe in April and May. The wood of this tree is white and light, of course it soon perishes; is chiefly used to make cattamarans (rafts for fishermen to go a fishing on). The flowers are exceedingly numerous, small, slightly tinged with yellow. Hermaphrodite and male mixed. Introduced 1800.

3. *AILANTUS MALABARICA* (Malabar *Ailanto*), Rheed. Mal. 6. t. 15. *Leaves abruptly pinnate; leaflets entire; samaras blunt at both ends, connected at the base.*—The Malabar *ailanto* grows to the height of fifty feet, and is rather more than twelve in diameter. Its wood is made into sheaths for spears, &c. A resinous juice flows from the bark when wounded. The leaves when bruised give an elegant tinge to water.

4. *AILANTUS MOLUCCAM* (Molucca *Ailanto*). *Leaves abruptly pinnate; leaflets entire; samaras acute at both ends, free from each other.*—This species is a native of the Moluccas, where it is a tree more than fifty feet in height.]

AIR (*Ær*, Lat. *Ær*, of *æ* *ai* *jûr*, because it always flows; or as others, of *ære*, to breathe). By air is meant all that fluid expanded mass of matter which surrounds our earth, in which we live and walk, and which we are continually receiving and casting out again by respiration.

The substance of which air consists may be reduced to two kinds, viz.

First, The matter of light or fire, which is continually flowing into it from the heavenly bodies.

Second, Those numberless particles, which in form either of vapours or dry exhalations, are raised from the earth, water, minerals, vegetables, animals, &c. either by the solar, subterraneous, or culinary fire.

Elementary air, or air properly so called, is a certain subtle, homogeneous, elastic matter, the basis or fundamental ingredient of the atmospherical air, and that which gives it the denomination.

Air therefore may be considered in two respects; either as it is an universal assemblage, or chaos, of all kinds of

bodies; or as it is a body endued with its own proper qualities.

First, That there is fire contained in all air is demonstrable, as it is evident that there is fire existing in all bodies, and to this fire it is that air seems to owe all its fluidity; and were the air totally divested of that fire, it is more than probable that it would coalesce into a solid body; for it is found by many experiments, that the air condenses and contracts itself so much the more, the less degree of warmth it has; and, on the contrary, expands itself the more, according as the heat is greater.

Second, In respect of exhalations, air may be said to be a general collection of all kinds of bodies; for there are no bodies but what fire will render volatile, and disperse into air; even salts, sulphurs, and stones, nay and gold itself, though the heaviest and most fixed of all bodies are convertible into vapours by a large burning-glass, and are carried on high.

Those floating particles, thus raised from terrestrial bodies, are moved and agitated by the fiery particles divers ways, and are diffused through the whole atmosphere.

Of the matters thus raised in the atmosphere, those which come from fluid bodies are properly called vapours, and those from solid or dry ones, exhalations.

The cause of this volatility and ascent is the fire, without which all things would fall immediately down towards the centre of the earth, and remain in eternal rest.

Thus, if the air be full of vapours, and the cold succeeds, these vapours before dispersed are congregated and condensed into clouds, and thus fall back again into the form of water, rain, snow, or hail.

From the time of the entrance of the spring till autumn the evaporation is constant; but then it begins to fail, and in the winter ceases, to lay up fresh matter for the coming season.

And thus it is that frosty winters, by congealing the waters, and by covering the earth with a crust, and thus imprisoning the exhalations, make a fruitful summer.

And this seems to be the reason why in some countries, where the winter is severer than ordinary, the spring is more than ordinary fruitful; for in such

places the exhalations being pent up a long time, are discharged in the greater quantity, when the sun makes them a passage; whereas, under a feebler cold, the flux would have been continual, and consequently no great stock reserved for the next occasion.

This vaporous matter then being at length received into the atmosphere, is returned again in the form of rain, a forerunner of a plentiful crop.

As the sun retires the cold succeeds, and thus the diversity of the seasons of the year depends on a change in the face of the crust of the earth, the presence of the air, and the course of the sun.

Hence we conceive the nature of meteors, which are all of them either collections of such vapours and exhalations, or dispersions thereof.

The subtiler oils are always rising into the air. Now two clouds, partly formed of such oils, happening to meet and mix, by the attrition, the oil frequently takes fire, and hence proceed thunder, lightnings, and other phenomena, which may be farther promoted by the disposition of the clouds to favour the excitation.

And hence arise great and sudden alterations in the air, inasmuch that it shall be now intensely hot, and raise the spirits perhaps to eighty-eight degrees in a thermometer; and yet, after a clap of thunder with a shower, it shall fall again in a few minutes no less than twenty or thirty degrees.

It is therefore impossible to pronounce what the degree of heat will be in any given place at any time, even though we know ever so well the places and position of the sun and planets with respect to us, since it depends so much upon other variable things, which cannot be ascertained.

The lower the place, the closer, denser, and heavier is the air, till at length you arrive at a depth where the fire goes out; so that miners, who go deep, to remedy this inconvenience, are forced to have recourse to an artificial wind, raised by the fall of waters, to supply the place of the other air.

Now, considering the air as such a chaos, or assemblage of all kinds of bodies, and a chaos so extremely liable to change, it must needs have a great influence on vegetable bodies.

Third, Air considered in itself, or

that properly called air. Besides the fire and exhalations contained in the circumambient atmosphere, there is a third matter, which is what we properly mean by air.

To define the nature of it would be extremely difficult, inasmuch as its intimate affections are unknown to us; all we know is,

First, That air is naturally an homogeneous similar body.

Second, That it is fluid.

Third, That it is heavy.

Fourth, That it is elastic.

Fifth, That it rarifies by fire, and contracts by cold.

Sixth, That it is compressible by a weight laid thereon, and rises, and restores itself upon a removal of the same: all which circumstances should incline it to coalesce into a solid, if fire were wanting.

First, Air is divided into real and permanent, and apparent or transient.

Real air is not reducible by any compression or condensation, or the like, into any substance besides air.

Transient air is the contrary of the former, and by cold, &c. may be condensed into original water; the difference between permanent and transient air amounts to the same as that between vapour and exhalation; the one, *e. g.* being dry and the other moist.

Hence, as Sir Isaac Newton says, it is, that as the particles of permanent air are grosser, and arise from denser bodies than those of transient air or vapour, true air is more ponderous than vapour, and a moist atmosphere lighter than a dry one.

This real air is no where found in its purity, but that air which concerns us, and the properties and effects of which are chiefly to be considered, is that which has been before treated on and described, which Mr. Boyle acknowledges to be the most heterogeneous body in the universe; and Dr. Boerhaave shows it to be an universal chaos and *colluries* of all the kinds of created bodies in the universe, and in which may be found whatever fire can volatilize.

Second, That the air is fluid, appears from the easy passage it affords to bodies through it; as in the propagation of sounds, smells, and other effluvia; for these things show it to be a body that gives way to any force impressed, and in yielding are easily moved among

themselves, which are the properties of a fluid; so that few persons will dispute, whether air be a fluid, and thence being always in motion, and always moving other bodies, for no surface of any liquor that is contiguous to the air, can be at rest.

Third, As to the gravity or heaviness of the air, that is likewise easily proved; for that the air is heavy is evident from its being a body, weight being an essential property of matter.

Sense and experiment sufficiently prove this: for, if a person lay his hand upon an open vessel placed on an air-pump, and the air be exhausted, he will sensibly feel the load of the incumbent atmosphere to increase, and press upon the upper part of his hand, as the air is exhausting.

In like manner, a hollow sphere of five or six inches diameter, divided into two segments exactly fitting each other, after the air is exhausted out of them, are pressed together with a force equal to a hundred pounds weight, and will require the strength of two strong persons to pull them asunder; which, as soon as ever the air is let into them again, will fall asunder by the mere weight of the under hemisphere.

Mr. Boyle found that a lamb's bladder, containing about two-thirds of a pint, blown up, and well dried, lost about a grain and one-eighth when it was pricked and the air let out.

Mr. Gravesande found that the air in a glass ball of about two hundred and eighty-three inches capacity, weighed a hundred grains; and according to Burcher de Volder, a cubic foot of air is in weight one ounce and twenty-seven grains.

Mr. Boyle has computed that the weight of any quantity of air, near the surface of the earth, is to water as 1 to 1000; and Dr. Halley, as 1 to 800; and Mr. Hawksbee as 1 to 885; and the gravity of the same quantity of air to the same quantity of mercury, as 1 to 10,800.

Air therefore may be considered as an universal operculum, or cover, which by its weight keeps all terrestrial bodies down, and hinders them from flying off.

Fourth, The air is elastic. Elasticity is a quality whereby a body yields to any external impressions by contracting itself into less compass; and upon removing or diminishing the impressive

power, returns to its former space or figure. And by this quality, the air is distinguished from all other bodies in the atmosphere; neither fire nor exhalations appearing to be elastic, at least in any notable degree.

That there is such a quality in the air, is evident from innumerable experiments; and this property is inseparable from it. A bladder full blown being squeezed in the hand, the included air may be sensibly perceived to resist the touch; so that upon ceasing to compress it, the cavities or impressions, which were made in its surface, are immediately expanded again, and filled up.

Thin glass bubbles, or bladders full of air, exactly closed, and put into the receiver of an air-pump, the air being exhausted out of the receiver, the glass bubbles fly in pieces by the force of the air included in them.

From these experiments, and many others, it appears, that the air we breathe near the surface of the earth is compressed by its own weight into at least 1,679 parts of the space it would possess in vacuo; and if the same air be condensed by art, the space it will occupy, when most dilated, will be as 505,000 to 1, to that which it possesses when condensed; and Dr. Wallis suggests, that we are far from knowing the utmost it is capable of.

Nor does this power appear capable by any means to be destroyed or diminished; for Mr. Boyle made several experiments with a view to discover how long air (brought to the greatest degree of expansion to which he could reduce it in his air-pump), would retain its spring, but could never observe any sensible diminution; although the air was clogged some months with a weight that one would wonder how it should support it one moment.

It is, indeed, a wonderful property in air, that it should be capable of being contracted and extended infinitely; but, as hath been said, it does not appear, by all the experiments yet tried, that there are any limits of its compression or expansion; but still by the addition of a new weight, it will contract farther; and by taking the weight away, will expand farther.

Fifth, Air rarifies by fire, and contracts by cold.

The colder the air is, the less space it takes up; and, on the contrary, the

warmer the air is, the larger space it possesses; and thus cooling and compression have the same effects upon air, and keep pace with each other.

The same rule may be applied to warming and diminishing of weight, or heat and expansion, which go hand in hand.

And to the same elastic power before-mentioned, and its being expanded by heat, it is owing, that air inclosed in glass vessels, at a time when it is much condensed, and when it afterwards comes to expand by a further degree of heat, frequently bursts the bottles.

Sixth, Air is compressible by a weight laid thereon, and rises and restores itself upon a removal of the same. This property has been sufficiently shown by what has been said before, and especially under the head of elasticity; wherefore, having considered the properties of air, I shall take notice of some of its operations and effects as to the business of vegetation.

Air, by being heavy and fluid, invests the whole earth, and presses all the bodies thereon with a great force, equal to what they would sustain from the pressure of a column of *twenty-nine* inches depth of mercury, or *thirty-two* feet of water; and constringes and binds them down with a force amounting, according to the computation of Mr. Paschal, to 2,232 pounds weight upon every square foot, or upwards of *fifteen* pounds upon every square inch. Hence it prevents, *e. g.* the arterial vessels of plants and animals from being too much distended by the impetus of the circulating juices, or by the elastic force of the air so plentifully lodged in the blood of one, and the sap of the other. For,

The air presses equally every way, as is confirmed in what we observe of soft bodies sustaining this pressure without any change of figure, and brittle bodies without their breaking.

Air is a principal cause of the vegetation of plants, an instance of which we have from Mr. Ray, in the *Philosophical Transactions*, of Lettuce-seed, that was sown in the glass-receiver of the air-pump, which was exhausted and cleared from all air, which grew not at all in eight days' time; whereas some of the same seed that was sown at the same time in the open air, was risen to the height of an inch and a half in that

time; but the air being let into the empty receiver, the seed grew up to the height of two or three inches in the space of one week.

That a certain portion of air is necessary to preserve the growing quality of seeds is manifest, from many repeated experiments; by putting up seeds into glass bottles, and sealing the bottles hermetically. In six months those seeds have lost their growing quality; whereas part of the same seeds which were kept in bags, grew at the age of two years; therefore persons should be cautious not to exclude the air from their seeds, if they intend they should grow.

Another instance of the usefulness of the air in vegetation, is the sedum, which will push out roots without earth and water, and live for several months. Some sorts of aloes, if hung up in a room entirely secured from frosts, will remain fresh for some years, though they will sensibly lose in their weight.

Air is capable of penetrating the porous and spongy parts of plants, of being there contracted, and dilating itself again.

The air operates also within the bowels of the earth, and by its subtilty perspiring through the pores, assists in the rarefaction of the crudities of the earth, and in the dispelling all superfluous moisture, entering into the very pores and veins of the trees, plants, herbs, &c. carrying along with it those salts contained either in itself, or lodged in the earth; which salts or juices, are altered according to the several figures or dimensions of the different strainers or vessels of those several plants, which grow upon the same spot of earth, which is so impregnated with these salts: and thence proceed those varieties in taste and smell, notwithstanding they all receive their nourishment from the same stock that is lodged in the earth.

The air also affects the branches, leaves, and flowers of trees, plants, and herbs, entering and perspiring through them, and even through the bark and body of the tree; and by the same kind of subtilty it does, by its refreshing breezes, moderate the intenseness of the sun-beams, cooling, cheering, blowing, opening and extending all the offspring of nature.

The air fixes and insinuates its aërial substance into the liquid sap of vege-

tables: and as all the agitations in nature proceed from the contrariety of parts inhabiting together, in this, aërial and liquid substances being mixed, cause this agitation and motion in vegetables, or, more properly, set it all into a ferment (whether it be in the roots, or in the stem); and it rises by co-operation of the sun (which is the third agent in vegetation) up to the top of a tree, &c. as liquids rise by fire to the top of the containing vessel. This air, we find, produces a vibratory motion in several bodies; and particularly in plants, the air-vessels of which perform the office of lungs: for the air contained in them, sometimes contracting, and sometimes expanding, according as the heat is increased or diminished, presses the vessels, and eases them again by turns; and thus promotes a circulation of their juices, which could scarcely be otherwise effected.

Air, says the learned Dr. Hales, is a fine elastic fluid, with particles of very different natures floating in it, whereby it is admirably fitted by the great Author of nature to be the breath or life of vegetables as well as animals, without which they can no more live nor thrive than animals can.

As a proof of the great quantities of air in vegetables, he refers to the third chapter of his excellent treatise of *Vegetable Statics*, where he says, in the experiments on vines, the great quantity of air was visible, which was continually ascending through the sap in the tubes; which manifestly shows what plenty of it is taken in by vegetables, and is perspired off with the sap through the leaves.

He adds several experiments, as to an apple branch, apricot branch, birch, and other plants, to prove the same thing.

Dr. Grew has observed, that the pores are so large in the trunks of some plants, as in the better sort of thick walking-canes, that they are visible to a good eye without a glass; but with a glass, the cane seems as if stuck at top full of holes with great pins, so large as very well to resemble the pores of the skin in the ends of the fingers and ball of the hand.

In the leaves of pines, they are likewise through a glass a very elegant show, standing almost exactly in rank and file through the length of the leaves.

Whence it may be thought probable, that the air freely enters plants, not only with the principal fund of nourishment by the roots, but also through the surface of their trunks and leaves, especially at night when they are changed from a perspiring, to a strongly imbibing state.

Dr. Hales likewise tells us, that in all those experiments that he tried to this purpose, he found that the air entered very slowly at the bark of young shoots and branches, but much more freely through old bark; and that in different kinds of trees it had different degrees of more or less free entrance.

And likewise, that there is some air both in an elastic and unelastic state, mixed with the earth (which may well enter the roots with the nourishment), he found by several experiments, which he gives in the before-mentioned treatise.

The excellent Mr. Boyle, in making many experiments on the air, among other discoveries found, that a good quantity of air was producible from vegetables, by putting grapes, plums, gooseberries, pease, and several other sorts of fruits and grains into exhausted and unexhausted receivers, where they continued for several days emitting great quantities of air.

This put the curious Dr. Hales upon farther researches to find out what proportion of air he could obtain out of the different vegetables, in which it was lodged and incorporated, which he performed by divers chymio-statical experiments, which he gives in many instances in his treatise of the analysis of the air, plainly showing in what manner he performed them, and the events of them.

That from half a cubic inch, or 135 grains of heart of oak, fresh cut from a growing tree, there were 108 cubic inches of air generated, which is a quantity equal to 216 times the bulk of the piece of oak; that the weight of it was above 30 grains, one quarter part of the weight of 135 grains.

And he adds, that he took the like quantity of thin shavings from the same piece of oak, and dried them at some distance from a gentle fire for 24 hours; in which time they evaporated 44 grains of moisture; which 44 grains deducted from 135 grains, there remains 91 grains for the solid part of the oak: then 30 grains will be one-third of the weight of the solid part of the oak.

He gives another experiment of Indian wheat, which grew in his own garden, that he took 388 grains of it when it was not come to its full maturity, and that there were generated from it 270 cubic inches of air; the weight of which air was 77 grains, viz. one-fourth of the weight of the wheat.

And again, that a cubic inch, or 318 grains of pease generated 396 cubic inches of air, or 113 grains, *i. e.* something more than one-third of the weight of the pease.

And again, that from one ounce, or 437 grains of mustard-seed, 270 cubic inches of air were generated, or 77 grains, which is more than one-sixth part of the ounce weight.

He likewise adds, that there is great plenty of air incorporated into the substance of vegetables, which, by the action of fermentation, is roused into an elastic state, as is evident from these experiments following.

On the 2d day of March, he poured 42 cubic inches of ale from the tun, which had been there set to ferment 34 hours before into a bolt head; and from that time to the 9th of June, it generated 639 cubic inches of air, with a very unequal progression, more or less, as the weather was warm, cool, or cold; and sometimes, upon a change from warm to cool, it resorbed air, in all 32 cubic inches.

From the 2d of March to the 16th of April, 12 cubic inches of Malaga raisins, with 18 cubic inches of water, generated 411 cubic inches of air; and then again, it resorbed 35 cubic inches in two or three cold days. From the 21st of April to the 16th of May, it generated 78 cubic inches; after which, the 9th of June, it continued in a resorbing state, so as to resorb 13 cubic inches: that there were at that season many hot days, with much thunder and lightning, which destroys the elasticity of the air: there were generated in all 489 cubic inches, of which 48 were absorbed. The liquor was at last rapid.

On the 10th of August, 26 cubic inches of apples being smashed, they generated 986 cubic inches of air in 13 days' time, which is a quantity equal to 48 times their bulk; after which they resorbed a quantity equal to their bulk, in three or four days, notwithstanding the weather was then very

hot; after which time they were stationary for many days, neither generating nor absorbing.

From which before-mentioned experiments on raisins and ale, the ingenious author concludes, that wine and ale do not turn vapid in warm weather by imbibing the air, but by fermenting and generating too much; by which means they are deprived of their enlivening principle the air: for which reason, these liquors are best preserved in cool cellars, whereby this active invigorating principle is kept within due bounds; which when they exceed, wines are upon the fret, and are in danger of being spoiled.

Upon these, and many other experiments, which the learned author has given in his aforesaid treatise, he observes, that this air which arises in so great quantities from fermenting and dissolving vegetables, is true permanent air; which is certain, by its continuing in the same expanded and elastic state for many weeks and months, which expanded watery vapours will not do, but soon condense when cold.

Upon the whole, he concludes, that air abounds in vegetable substances, and bears a considerable part in them; and if all the parts of matter were only endowed with a strongly attracting power, all nature would then immediately become one unactive cohering lump.

Wherefore it was absolutely necessary, in order to the actuating this vast mass of attracting matter, that there should be every where mixed with it a due proportion of strongly-repelling elastic particles, which might enliven the whole mass by the incessant action between them and the attracting particles.

And since these elastic particles are continually in great abundance reduced by the power of the strong attracters, from an elastic to a fixed state, it was therefore necessary that these particles should be endued with a property of resuming their elastic state, whenever they were disengaged from that mass in which they were fixed, that thereby this beautiful frame of things might be maintained in a continued round of the production and dissolution of vegetables as well as animal bodies.

The air is very instrumental in the production and growth of vegetables, both by invigorating their several

juices, while in an elastic active state, and also by greatly contributing in a fixed state, to the union and firm connection of the several constituent parts of those bodies, *viz.* their water, fire, salt, and earth.

To conclude, by reason of those properties of the air before mentioned, it is very serviceable to vegetables, in that it blows up and breaks open the clouds, those treasures of rain, which fertilize the vegetable kind.

The air also helps to waft or disperse those foggy humid vapours which arise from the earth, and would otherwise stagnate, and poison the whole face of the earth.

The air, by the assistance of the sun, assumes and sublimates those vapours into the upper regions; and these foggy humid vapours are, by this sublimation, and the coercive power of the air and sun, rarefied and made of second use in vegetation.

And on the contrary, to the benign quality of the air, which is so many ways subservient to vegetables, it is also sometimes, and upon some accounts, injurious and pernicious to them, not only to the ligneous, herbaceous, and flowery parts above, but also to the roots and fibres below; for in that, the air penetrates into the earth, it is easy to be concluded, that a dry, husky, scorching air, may be very prejudicial to the tender fibres of newly planted trees.

It may be likewise supposed, that all bodies of earth are more or less capable of imbibing the fluid air, and of attracting such salts as either the air can give, or the earth is capable of receiving.

[THE CHEMICAL COMPOSITION AND PROPERTIES OF ATMOSPHERIC AIR.]

—A subject which cannot be contemplated in all its bearings without exciting astonishment and admiration;—a subject, indeed, which involves all the leading, and many of the minor circumstances, by which the line of demarcation is marked out between the chemistry of former times and the chemistry of the present day, with more decision, fulness, and force, than, perhaps, is done in any other department of scientific inquiry.

The leading feature, and important novelty of the science, as influencing its progress in the last century, was cer-

tainly the discovery of gaseous bodies, and the perfection of pneumatic chemistry, without which analysis could have made but little progress; and independent of which all improvement in theory would have been but lame and ineffectual. It was also assisted materially, though less directly, by those investigations respecting the agency of heat, in which Dr. Black made himself so eminently conspicuous.

It is now about 200 years since the fusing of some substances in the open air was distinctly observed to be attended with an increase of weight. Le Brun having melted two pounds six ounces of tin, found that in six hours the whole had passed into a state of calx, weighing three pounds one ounce; and, being puzzled at the circumstance, he consulted RAY, a physician of Perigord, as to its cause, who immediately set about an investigation of the matter, which terminated in explicitly referring the cause of the increase to the fixation of air.

Hooke in his investigations, and Boyle by his experiments with the air-pump, which was now just perfected and coming into use, succeeded not merely in demonstrating the important part performed by the pressure of atmospheric air in combustion, but Hooke carried his inquiries still further, and, in his mind's eye at least, seems to have seen and anticipated the results that were gained at a much later period of chemical science, and established upon a less questionable authority.

John Mayow (who was born in Cornwall, in the year 1645, and died in London, 1697, at the house of an apothecary, in York-street, Covent Garden) seems to have been early struck with the analogy between the phenomena of combustion and those of respiration. He burned a candle-end in a bell-glass, and found the air so deteriorated as to be unfit for the continuance of combustion. He then confined a mouse in a similar portion of air, and it soon manifested the want of renewal. Then, by putting a mouse and a candle under the same bell-glass, he found it live only half the time that it had survived when under the glass alone. He then renewed the experiment, and endeavoured to fire combustible matter in air that had been spoiled by breathing; and, finding that it would not burn, he observes, that "*the nitro-aërial particles are ab-*

sorbed both by the candle and the animal." Examining the residuary air standing over water after combustion, he found that it was a little lighter than the atmosphere, and extinguished flame. Then he described the deleterious as well as the vivifying portion of the atmosphere, and speaks of the former as a non-supporter of combustion, of its being not absorbable by water, and, as we have intimated, of its being lighter than atmospheric air itself.

The next individual whom it is in order to name in this historical sketch, is Dr. Hales, who was born in Kent, in the year 1677, and died at Teddington, 1761. This highly-talented and virtuous man commenced the communication of his researches to the *Royal Society* about the year 1717, and in 1727, he published his *Statical Essay*, containing a specimen of an attempt to analyze the air by a great variety of chemico-statical experiments, which were read at several meetings before the Royal Society.

In the course of his investigations, Dr. H. observed that phosphorus, when burned, *absorbed air*, and produced white fumes; but he neglected any examination of the product or of the residue. He distilled air from wood, and found it fatal to animals; from Newcastle coal he obtained one-third its weight of gas; from nitre, one hundred and eighty times its bulk; and from salt of tartar, urged by intense heat, he also procured aeriform matter; but in no one instance did he examine these gaseous bodies with the attention that might have been expected from an experimentalist so diligent and original.

In the experiments on respiration, Dr. Hales obtained results of such interest, that one is surprised at the coldness with which he pursued them, and the carelessness with which he drops the inquiry. Finding that a given quantity of air could only be respired for a given time, and that it soon produced oppression and difficulty of breathing, in consequence, as he says, "of the gross and sulphureous vapours with which it becomes loaded," he endeavoured to discover some substance, which, by absorbing those vapours, might render respired air more fit for breathing, and consequently contribute to its purification in small and crowded rooms, and other similar situations.

These charges of oversight and neglect, when seemingly a little closer attention might have effected so much in the way of discovery, is, however, scarcely applicable to this great man's researches respecting the connection of the vegetable world, with the circumambient air. Besides other important particulars, which are not applicable to our present purpose, he engaged in a series of experiments, to show that a considerable quantity of air is inspired by plants: but still he always fails of precisely discriminating between common air and the various gaseous products that resulted from some of his experiments; and, therefore, as was likewise the case with his cotemporary Boerhaave, stopped short of giving anything like a satisfactory account of the component parts of atmospheric air.

To Dr. Black, who was born in France, of Scotch parents, in 1728, and died at Edinburgh, in 1799, belongs, first, the merits of discovering carbonic acid gas, first called *fixed air*; and secondly, the different relations of bodies to heat, independently of temperature. It had already, indeed, been observed, that ice, during liquefaction, retained an uniform temperature of 32°; and that water, during its boiling, never became hotter than 212°: hence the use of these fixed points in the graduations of thermometers. Dr. B.'s remarks established this very important and commanding principle, *viz.* that, independently of temperature, and even of form, heat attaches itself to material substances in such sort as to be lost to the senses, or become hidden. We have now to advert to the labours of another philosopher, whose investigations on the subject of air, have proved especially available in reference to the topic under notice, *viz.* the chemical habits and circumstances and compositions of the air we breathe. What was by him called *dephlogisticated air*, and what is now usually termed *oxygen gas*, was discovered by Dr. Priestley, on the first of August, 1774. Nitre and other substances were shown by Dr. Priestley to afford this kind of air, and in the event it came to be ascertained, that the matter thus detected by our experimentalist, as a constituent, so to say, of those bodies, is in truth the main vivifying ingredient of the aerial mass in which we are enveloped.

The constitution indeed of the atmosphere, was one among the many enquiries that engaged Dr. Priestley's diligence, and that was made out during the period of his activity. In 1772, Dr. Rutherford demonstrated the existence of a peculiar elastic fluid in atmospheric air, differing from fixed or mephitic air; and yet, like it, extinguishing flame, and unfit for respiration. This component part of the atmosphere, was denominated by Dr. Priestley, *phlogisticated air*, as the other had been denominated *dephlogisticated*.

While Priestley was thus occupied in Britain, Scheele, on the Continent, was almost simultaneously engaged in investigations that led to nearly similar results. Finding air necessary for the production of fire, this last experimentalist, turned his attention to its analysis. He found that a solution of liver of sulphur, and certain other sulphureous compounds, occasioned a diminution in the bulk of air to which they were exposed, equal to one part in about five. He likewise obtained what he calls *empyreal air*, the *dephlogisticated air* of Priestley, and the oxygen gas of the new nomenclature, by the decomposition of the nitrous acid and other processes; he also shows by direct experiments, that the absorption occasioned in atmospheric air by liver of sulphur, is referrible to the abstraction of its empyreal portion; that it totally absorbs empyreal air; and that, upon adding to the residuary portion of atmospheric air, a quantity of empyreal air, equal to that absorbed by the sulphureous liquor, an air is again compounded, similar in all respects to that of the atmosphere.

But now the terms *dephlogisticated*, *empyreal*, &c. were to be exploded, and a new nomenclature introduced into the science of pneumatic chemistry, founded on the principle, that the old theories assumed the presence of an undemonstrable material. One of the first steps that led to the detection of aerial circumstance, was the observation that the burning of some materials in the open air, occasioned an increase of weight in the materials treated; this increase of weight in the calcined body, was subsequently found to correspond, *cæteris paribus*, with the quantity of air that disappeared during the experi-

ment; and it is upon this fact that the Lavoisierian or oxygenous theory came to oppose itself to the phlogistic principles and nomenclature of Priestley and others. Lavoisier analysed atmospheric air in the following way:—he exposed 50 cubic inches of it to heated mercury, by which it underwent a decrease equal to one-sixth of its original bulk, and became unfit for respiration and combustion; at the same time the quicksilver was partly converted into a reddish matter, forty-five grains of which, heated red hot in a proper retort, afforded 41.5 of running mercury, and seven or eight cubical inches of gas, eminently supporting combustion, and being the dephlogisticated air discovered by Priestley. The re-combination of the 42 cubical inches of the mephitic air of the retort, with the eight cubical inches of dephlogisticated air, separated from the mercury, re-produced 50 cubic inches of atmospheric air.

Thus we see, by taking a slight retrospective glance upon the ground that has been gone over, that Le Brun's experiment on combustion, together with Mayow's observations of the concentration of nitro-aërial particles, that Hale's subsequent experiments proving the absorption of air during combustion and respiration—that Black's discovery of the actual fixidity of air, and the latency of heat; and, lastly, that Priestley's detection of the presence of dephlogisticated air, or, according to the more modern nomenclature oxygen gas, in the presence of certain metallic substances, have constituted altogether the materials out of which our present knowledge of the laws and constitution of the atmosphere has come to be established.

ATMOSPHERIC AIR is composed of at least two species of air, or elastic fluid—the one called *oxygen gas* or *vital air*, the other *azotic*, or more recently *nitrogen gas*. The first of these is the great agent in respiration and combustion, and upon the proper proportion of it depends the purity of the atmosphere. The latter possesses contrary qualities, is noxious to animals, and incapable of maintaining combustion; the proportion of these two parts of atmospheric air, is commonly about 26 or 27 parts of oxygen air, and 74 or 73 parts of azotic gas by weight; or about 22 parts

of the former, and 78 of the latter, by bulk. A small portion of hydrogen and carbonic acid gases are found, indeed, to enter its composition; but these two last ingredients are naturally in such small quantity as scarcely to deserve notice.

The immense mass of permanently elastic fluid, says Ure, which surrounds the globe we inhabit, must consist of a general assemblage of every kind of air which can be formed by the various bodies which compose its surface. Most of these, however, are absorbed by waters; a number of them are decomposed by combination with each other; and some of them are seldom disengaged in considerable quantities by the processes of nature. *Hence it is, that the lower atmosphere consists chiefly of oxygen and nitrogen*, together with moisture, and the occasional vapours or exhalations of bodies. The upper atmosphere seems to be composed of a large proportion of hydrogen, a fluid of so much less specific gravity than any other, that it must naturally ascend to the highest places, where, being occasionally set on fire by electricity, it appears to be the cause of the aurora borealis and fire balls.

In the historical sketch we have above given of the successive steps by which we have acquired the knowledge of aërial compound, will have been seen the Lavoisierian mode of analysing the air; but it may be right to be still more particular on this head, and give the following experimental method of ascertaining the component principles of the atmosphere.

If heat, then, be applied to mercury inclosed in a proper vessel of atmospheric air, the air will be diminished, and the mercury will lose its splendour, gradually changing to a reddish powder, and acquiring an addition to its weight. When no further change is observed, the separation of the principles of air has taken place. That portion which remains in the receiver is unfit for supporting flame, or maintaining respiration, and is azotic or nitrogen gas; the other part, which is oxygen gas, is absorbed by the mercury, which it reduces to the state of an oxide, and from which it may afterwards be extracted by heat. By this last operation the mercury will be restored to its metallic state, and will

lose the weight it has acquired during its oxidation.

These separated gases thus differing in their properties from each other and from atmospheric air, being again mixed in the proportions above stated, form atmospheric air of the ordinary degree of purity; differing from it, however, in some trifling respects, yet not so much as to invalidate the general conclusion; but which differences are probably occasioned by our inability to combine the ingredients so perfectly as they are combined by nature.

Oxygen, then, and Azote, being the main and primary, while carbonic acid, and Hydrogen gases are the less and more incidental components of the atmosphere; we shall treat separately of these several ingredients in the order above enumerated.

Air vital, or *OXYGEN gas*, is a substance destitute both of taste and smell, but possessing in an eminent degree the power of increasing and supporting animal life and combustion. It is heavier at the same time than atmospheric air, in the proportion of 103 to 100, and the latter maintains life only in consequence of the quantity of this fluid it contains. This proportion is rated at 27 in 100.

Its specific gravity is 1,111, 100 cubic inches weigh 33.88 gr.

This air changes the colour of animal and vegetable substances. It is a composition of oxygen and caloric. Combustion by it is rendered amazingly intense; and its powers, when urged by the blowpipe, far exceed the powers of any burning lens.

A lighted wax-taper, fixed to an iron wire, and let down into a vessel of this gas, burns with an inconceivable brilliancy. If the taper is blown out, and let down into a vessel of the gas, while the snuff remains red-hot, it instantly re-kindles. A red-hot piece of charcoal immersed in this gas, throws out beautiful sparks. In this gas thin iron wire will burn with beautiful effect. During every combustion in oxygen gas, the gas suffers a material diminution; and all bodies by combustion in it acquire an addition to their weight.

Oxygen or the basis of *oxygen gas*, is naturally or artificially combined with a great variety of substances. From

some of these it may be detached by the simple application of heat, since it has a remarkable attraction for caloric, or the matter of fire, with which, when it unites, it becomes expanded, and assumes the form of gas or air.

The substances from which it may be most easily extracted, by means of heat, are red lead, calcined mercury, nitre, and manganese. Dr. Priestley exposed a quantity of red lead in the focus of a burning glass twelve inches in diameter. A quantity of fixed air, or carbonic acid gas, as it is now called, was always produced at first; but after that was separated, the remainder was found to support flame, and to sustain animal life, much more vigorously than common air, and to have all the characters of *oxygen gas*.

By various succeeding experiments of Dr. Priestley and others, it however appears, that *oxygen air*, may be obtained not only by means of heat, but also by the action of the vitriolic and nitrous acids upon a number of mineral and metallic substances.

This kind of air may also be obtained by the same process, from the native oxid, or calx of manganese, or from minium or red lead, which, it is well known, is an oxid of lead, or lead united with oxygen.

There is, however, a method by which *oxygen gas* may be obtained with less heat and greater facility, and it is as follows: put some red lead into a bottle, together with some good strong oil of vitriol, but without any water. Let the red lead fill about a quarter of the bottle, and the vitriolic acid be about the same quantity, or very little less; then apply a bent tube to the bottle by inserting it through a cork, and having inverted another bottle filled with water in a basin about half-filled also with water, direct the other end of the crooked tube into the bottle inverted in the water. In this stage of the process we must observe, that without heat this mixture of red lead and vitriolic acid will not afford any *oxygen air* or a very inconsiderable quantity; it is necessary, therefore, to apply the flame of a candle or wax taper to the bottle containing the ingredients, while the crooked tube opens a communication between this bottle and that inverted in the water. In this manner the red lead will yield a quantity of

elastic fluid which will pass through the crooked tube into the inverted bottle, and as the quantity of *oxygen air* increases in the inverted bottle, the water in it will be seen to subside; this air will not be all pure, because a considerable quantity of fixed air enters with it. In order to separate the fixed from the pure air, the inverted bottle, when filled with the compound of both, must be agitated in a basin of lime-water, by which means the lime water will absorb the whole quantity of fixed air, and leave the *oxygen gas* by itself.

Oxygen gas may also be obtained in considerable quantities from the decomposition of water, especially from pump-water, which, when exposed to the sun, emits air slowly; but after it has remained so for a considerable time, a green matter adheres to the bottom and sides of the glass vessel in which it remained; afterwards it emits pure *oxygen air* in great quantities and continues to do so for a long time after the green matter has exhibited symptoms of decay by turning yellow.

Dr. Ingenhousz rightly supposed this green matter to belong to the vegetable kingdom, and procured pure air by putting the leaves of plants into water, and exposing them to the sun. He observes that, of land vegetables the fittest for this purpose are the poisonous plants, such as *hyoscyamus*, *lauro-cerasus*, nightshade, &c. But he extracted the purest air from some aquatic vegetables, and from turpentine trees, but especially from the green matter he collected from a stone trough, which had been kept filled with water from a spring near the high road.

While Dr. Priestley was engaged in a series of experiments to enable him to purify contaminated air, he discovered that vegetables answered this purpose most effectually. The experiment by which he illustrates his assertion was this: having rendered a quantity of air very noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a sprig of mint into one of them, and keeping the other receiver with the contaminated air in it alone. He found about eight or nine days after, the air of the receiver, into which he had introduced the sprig of mint, had become respirable; for a mouse lived very well in this, but died immediately upon

being introduced into the other receiver, containing the contaminated air alone.

It has since been observed, that several animal substances, as well as vegetables, have a power of separating dephlogisticated air, or *oxygen gas*, from water when exposed to the action of the sun for a considerable time.

The ingenious Count Rumford observed, that raw silk has a remarkable power of producing pure air. He found, that by introducing thirty grains of this substance, first washed in water, into a thin glass globe four inches and a half in diameter, having a cylindrical neck three-fourths of an inch wide and twelve inches long, inverting the globe into a jar filled with the same kind of water, and exposing it to the action of the sun in the window, in less than ten minutes the silk became covered with an infinite number of air bubbles, gradually increasing in size, till at the end of two hours, the silk was buoyed up, by their means to the top of the water. They separated themselves by degrees, and formed a collection of air in the upper part of the globe, which, when examined by the established test, appeared to be very pure. In three days he collected three and three-fourths of a cubic inch of pure air, into which a wax-taper being introduced, that had just before been blown out, the wick only remaining red, it instantly took fire, and burned with a bright and enlarged flame. The water in the globe had acquired the smell of raw silk, it lost something of its transparency, and assumed a faint greenish cast.

It has been observed that when this experiment was made in the dark, only a few inconsiderable bubbles were formed, which remained attached to the silk; nor was it otherwise when the glass globe was removed into a German stove. In the latter case, indeed, some single bubbles had detached themselves from the silk, and ascended to the top, but the air was in too small a quantity to be either measured or proved.

In these experiments, the *oxygen* or pure air was extracted by an actual decomposition of a part of the water, by means of a capillary attraction, aided by the solar influence; and in effect the same philosopher was enabled to extract it, though in a smaller quantity, by means of a number of very minute

glass tubes immersed in water, and exposed to the sun.

The reason that pure air is the most essential of all the fluids to the support of life, is probably, because a great quantity of heat is necessary for this purpose, and because this fluid contains it in great quantity, and parts with it very freely when it meets with any substance with which it has an affinity. But as its basis (*oxygen*) combines itself very easily with the basis of coal which is found in the blood and lungs, and during this combination, loses part of its caloric, or heat, which goes to the support of life, the remainder of the caloric and oxygen, combined with the coal, from the acid carbonic gas or fixable air which is always found to exist in a larger quantity in air which has been respired, than in atmospherical air which has not been subservient to that function.

The pure air which we breathe performs two functions equally necessary to our preservation; it carries off from the blood that matter of coal, the superabundance of which would be pernicious, and the heat which this combination deposits in the lungs repairs the continual loss of heat which we experience from surrounding bodies. According to Dr. Priestley, and others, the basis of oxygen-gas is also absorbed by the blood.

Since, therefore, a great quantity of heat is disengaged from pure air in respiration, it follows, that this fluid must be very pernicious to animals who breathe this air alone for a considerable time; which is consonant with the observations of physicians, who have attempted to cure phthisis by the respiration of vital air. Whether the basis of this air is a simple or compound substance we are unable to determine; in the present state, however, of philosophical knowledge, we are justified in considering it as a simple elementary body, for it has never yet been decomposed.

Air Azotic, or Nitrogen gas, is a substance unlike the former, being incapable of supporting animal life. It extinguishes flame, and is only characterized by possessing none of the distinguishing qualities of the other known airs. It is lighter than common air, in the proportion of 985 to 1000: 100 cubic inches weigh 29.65 grains. It

may be considered indeed as the residue of common air, when vitiated by combustion. It is easily disengaged from animal matters, by a slight increase of temperature; but different parts of animals afford different proportions of it, and the concrescible fibrous matter the most. The portion of it they in general afford, is proportioned to their quantity of volatile alkali.

Azote or nitrogen gas has neither taste nor smell, and is not absorbed by water: it immediately extinguishes a lighted candle, and other burning substances: it is fatal to animals confined in it; plants, however, live and flourish in it: by it delicate blue colours are slightly reddened: and when mixed with oxygen gas, in the proportion of three or four parts of *azotic gas* to one of *oxygen*, it composes a mixture resembling atmospherical air. Its basis is azote, an elementary substance, which is also the basis of nitrous acid, or aquafortis. Its combination with oxygen gives it the acid character. In this state it is combined with that substance. In the state of atmospherical air it is only mixed.

It unites with oxygen in four proportions, besides that of atmospherical air, forming four important compounds. These are, 1st, the nitrous oxide, or protoxide of azote; 2nd, nitrous gas, nitric oxide, or deutoxide of azote; 3rd, nitrous acid; 4th, nitric acid. It also combines with chlorine and iodine, constituting, by the union, two very formidable compounds.

Azote has hitherto resisted all attempts to decompose it; but it is supposed to be of a compound nature, from its being found abundantly in the organs of animals which feed on substances that do not contain it.

Its uses in the economy of the globe are little understood. This is likewise favorable to the idea that its real chemical nature is as yet unknown, and leads to the hope of its being decomposable.

The first eudiometer was made in consequence of Dr. Priestley's discovery, that when nitrous gas is mixed with atmospherical air over water, the bulk of the mixture diminishes rapidly, in consequence of the combination of the gas with the oxygen of the common air, and the absorption of the nitric acid thus formed by the water.

It would appear that the atmospheric, azote and oxygen spontaneously combine in other proportions, under certain circumstances, in natural operations. Thus we find, that mild calcareous, or alkaline matters, favour the formation of nitric acid in certain regions of the earth, and that they are essential to its production in our artificial arrangements for forming nitre from decomposing animal and vegetable substances.

Carbonic acid gas is the first elastic æriform fluid, different from common air, that was known. We are indebted to Dr. Black, of Edinburgh, for a knowledge of some of its most remarkable properties. In the year 1755 he discovered the affinity between it and the alkalis; and Bergman, in 1772, proved that it was an acid.

Carbonic acid gas cannot support flame, nor animal life: its taste is acid. Neither light nor caloric seem to produce any effect upon it, except that the latter dilates it. It is absorbed by water. These two fluids, after considerable agitation, at last unite, and form an acid fluid. The colder the water, and the greater the pressure applied, the more carbonic gas it will absorb. Water, so impregnated, sparkles upon agitation: it has an acidulous taste, and reddens tincture of litmus. Heat disengages the gas from the water. *Carbonic acid gas* precipitates lime from its solution in water. It is eagerly attracted by the alkalis. Its specific weight is to that of atmospheric air, as 1500 to 1000. 100 cubic inches weigh 29 grains and two-thirds, at mean temperature and pressure. It may be poured from one vessel into another.

Of all the bases of the gases, that of *carbonic acid gas* is diffused in the greatest abundance throughout nature. It is found in the state of gas, and also in combination with a great variety of bodies.

Carbonic acid gas is often found in the lower parts of mines, caverns, tombs, and such other subterraneous places as contain materials for producing it: it is then called the *choke-damp*. The grotto Del Cane, near Naples, has long been famous for the quantity of this gas produced there, which is so great, that it runs out at the opening like a stream of water. A dog, or any other animal, is immediately killed, if its nose is thrust into the lower part of

the cavern. But the upper part of the cavern is quite free from the gas, as it does not rise high enough to mix with the atmospheric air.

Carbonic acid gas is likewise formed during fermentation. On account of its great weight, it occupies the empty space of the vessel in which the fermenting process is going on. It may, in this case, be collected by plunging a vessel into it.

Sir H. Davy took three inspirations of this gas, mixed with about one-fourth of common air; the effect was a temporary loss of sensation, which was succeeded by giddiness, sickness, acute pains in different parts of the body, and extreme debility. Some days elapsed before he entirely recovered. Since then Mr. Walker, of Dublin, was struck down in an apoplectic condition, by breathing this gas; but he was speedily restored by the inhalation of oxygen. It was the discovery of this principle in the mild alkalis and magnesia that led to such important inferences with respect to the fixability of gaseous matter.

Air, Inflammable, or Hydrogen gas. This air, named also fire-damp, is peculiarly distinguished by its great levity and inflammability. It is the lightest substance whose weight we are able to estimate. When pure, it is thirteen times lighter than atmospheric air, and it immediately explodes on mixture with oxygen. It is formed by the union of hydrogen and caloric. Its lightness is particularly evinced by its use in balloons. Plants grow in this fluid without impairing its inflammability. Water imbibes about one-thirteenth part of it; and when again expelled, it is as inflammable as ever. By this addition, both its bulk and specific gravity are increased; for it occupies one-eighth more space by its combination, and its weight is increased, so as to be only one-tenth lighter than common air.

According to M. Lavoisier, water is composed of 85 parts of oxygen and 15 parts of hydrogen. This philosopher has instructed us in the following method of obtaining this gas by heat only.

Let water pass drop by drop through the barrel of a gun, while it remains red-hot amidst burning coals; let a crooked tube be placed at the end of this iron, and bent, so that it may be

passed into a glass vessel full of water inverted in the pneumatic apparatus. There will then pass into the glass vessel an aëriform fluid, which is inflammable air or hydrogen gas. In this process the water suffers a decomposition, and while the hydrogen passes into the glass receiver, the oxygen unites with the substance of the gun barrel, and oxydates or rusts its internal surface.

The electric spark, also, taken in any species of oil, produces hydrogen or inflammable air, this substance being a constituent part of all the oils. The same may be said of æther, and alcohol or spirit of wine, which contain a great proportion of hydrogen.

M. Cavallo informs us, that he has procured this kind of air from the ponds about London, in the following manner: fill a wide-mouthed bottle with pond-water, and keep it inverted in it; then with a stick stir the mud at the bottom of the pond just under the inverted bottle, so as to permit the bubbles of air which rise to be received in the inverted bottle; and this air will be found to be inflammable.

The ignes fatui are supposed to proceed from the inflammable air which abounds in marshy grounds, and to be set on fire by electric sparks.

The most remarkable properties of this gas are, 1st, its great inflammability, which arises from its propensity to unite with oxygen and form water. 2^{ndly}, its extraordinary levity, as already noticed. 3^{rdly}, metals are very easily revived or reduced from a calyx or oxyd to the metallic state when heated in a receiver filled with this air. This also arises from its attraction for oxygen, which in this case is expelled from the calx; and, uniting with the hydrogen in the receiver to form water, leaves the metal pure, and in its natural state. 4^{thly}, plants vegetate in this fluid without impairing its inflammability. 5^{thly}, water will imbibe about 1-13th of its bulk of this gas.

This gas remains permanent over water: it is inflammable. Fill a small jar or common phial with the gas, and holding it with its mouth downwards, bring the gas into contact with the flame of a candle; the air will take fire, and burn silently with a bluish flame. In a strong phial mix equal parts of hydrogen gas and common air, and

apply to the mouth a lighted candle, and it will burn with a sudden and loud explosion. One part of oxygen gas, and two or three of hydrogen gas, will give a report equal to that of a pistol.

Hydrogen gas has an unpleasant smell; it extinguishes burning bodies; it is fatal to animals; and is, as we have observed, considerably lighter than atmospherical air.

These then are the three simple or original gases, from which, variously modified, all the rest are produced; and the first of these productions is universally diffused, and of the first importance to life, constituting an essential part of what we constantly breathe, and by which we are surrounded, atmospherical air.

It is a curious fact, that the proportions of the atmosphere are preserved under a vast variety of circumstances and place, and the proportion of oxygen to its antagonist ingredient, appears to be very nearly the same, whether it be in this country or on the coast of Guinea; on low plains, or lofty mountains; or even at the height of 7250 yards above the level of the sea; as ascertained by Gay Lussac, in his aërial voyage in September, 1805. This being the case, it becomes interesting to ascertain, or to endeavour at ascertaining, what are the provisions of nature, by which this proportion of oxygen in the atmosphere, that is continually consumed in respiration and combustion, is again restored to the atmosphere. As far as an estimate can be formed of the great and general operations of nature, there appears as great an *emission* as there is *consumption* of oxygen. Thus, in volcanic eruptions, there appears to be at least as much oxygen emitted, or extricated by fire, from various minerals, as is sufficient to maintain the combustion, and perhaps to ameliorate the atmosphere; and in the bodies of plants and animals, which appear in a great measure to derive their sustenance and augmentation from the atmosphere and its contents, it is found that a large proportion of nitrogen exists.

Most plants, as shown by the experiments of Dr. Priestley and others, emit oxygen in the sunshine, from which it is highly probable that they imbibe and decompose the air, retaining carbon, and emitting the vital part.

Lastly, if to this we add the decomposition of water, and the effects consequent upon the agitation of large seas and rivers, there will be numerous occasions in which the aqueous fluid will supply us with disengaged oxygen; while by a very natural supposition, the hydrogen of this fluid may be considered as having entered the bodies of plants, for the formation of oils, sugars, mucilages, &c. from which it may again be extracted. On this head, however, we have still much to learn.

On this interesting topic, which as we have just said, demands further investigation, we may here, with propriety, introduce an extract from an author, whose labours we have already made use of in the present article. Among the many and ingenious investigations of Dr. Priestley, says Mr. Brande, none have produced more pleasing subjects of inquiry, than those relating to the influence of vegetation upon air, contaminated by combustion, respiration, and the putrefaction of animal matters.

Finding that air was not spoiled by the growth of a sprig of mint kept in it for some months, our author thought it possible that the process of vegetation might restore the air injured by burning candles; and accordingly, on the 17th of August, 1777, he put a sprig of mint into air, in which a wax candle had burned out; and on the 27th of the same month, found that another candle burned perfectly well in it; and then to verify the conclusion, he divided the injured air into two separate portions, putting the plant into one of them, and merely leaving the other standing over water; he never failed to find, that a candle would burn in the former, but not in the latter.

This restoration of air, says Dr. Priestley, I found, depended upon the vegetating state of the plant; for though I kept a great number of the fresh leaves of mint, in a small quantity of air, in which candles had burned out, and changed them frequently for a long space of time, I could perceive no melioration in the state of the air. This remarkable effect does not depend upon any thing peculiar to *mint*; for I found a quantity of this kind of air, to be perfectly restored by sprigs of *balm*. Grounsel, spinach, and some other plants were used, with like effect, to

show that it did not depend upon aromatic effluvia.

In Dr. Priestley's observations on air, infected with animal respiration and putrefaction, a multitude of facts are adduced to demonstrate its renovation, when exposed to growing vegetables, and he is thus led to the following general remarks on the subject. "These proofs of a partial restoration of air by plants in a state of vegetation, though in a confined and unnatural situation, cannot but render it highly probable, that the injury which is continually done to the atmosphere by the respiration of such a number of animals, and the putrefaction of such masses of both vegetable and animal matter, is, in part, at least, repaired by the vegetable creation, and notwithstanding the prodigious mass of air that is corrupted daily by the above mentioned causes; yet, if we consider the immense profusion of vegetables upon the face of the earth, growing in places suited to their nature, and, consequently at full liberty to exert all their powers, both inhaling and exhaling, it can hardly be thought but that it may be a sufficient counterbalance to it, and that the remedy is adequate to the evil.

When treating on the economy of vegetation, we shall have again to advert to this subject, and to mention the experiments of Ingenhousz and others in reference to these particulars.

PROPERTIES OF AIR ON THE LIVING SYSTEM.—When chemistry had at length succeeded in fully unfolding the constitution of the atmosphere, it was natural enough to conceive that variations in the ingredients of which it was composed, whether found naturally or produced in an artificial manner, would be productive of much variety of effect on the physical constitution; hence was broached theories and opinions respecting a more or less oxygenous atmosphere—and hence also, speculations were eagerly engaged in, on the probable influence that artificial kinds of air might possess, in controlling the actions, or abating the malignancy of disease. It happened that pneumatic chemistry came into play and repute about the time that the public mind was agitated by the political convulsions that were going on in France and other countries; and this circumstance, aided by the novelty and interest of the new

views and doctrines, excited in the minds of some of the more ardent and enthusiastic, anticipations of the happiest results in the physical, as had already been supposed about to take place in the moral and political, relations of man.

"See palsy dance, spasmodic action still;
And asthma pace, without a puff, up hill."

These golden visions have, however, passed by, and it even appears that the administration of medicinal aid, through the medium of the pulmonary organs is now become unjustifiably neglected: there certainly are cases in which the inspiration of air, artificially made, more than ordinarily vivifying, might aid greatly in invigorating the frame, and restoring a healthy tone of action to organs debilitated by protracted disease; and it has often appeared to us probable, that a judicious employment of that singular combination of oxygen and azote, which constitutes the nitrous oxide or protoxide of azote, as above noticed, might, in the hands of judicious physicians, be made beneficially to apply, under several conditions of nervous derangement.

To justify this opinion, we may here cite a few examples taken from the researches of Sir H. Davy, of the extraordinary effects which followed the inspiration of this, as it had been called, laughter-producing gas.

Sir H. Davy first describes the effect it had upon himself as follows:—"Having previously closed my nostrils, and exhausted my lungs, I breathed four quarts of nitrous oxide from and into a silk bag. The first feelings were those of giddiness; but in less than half a minute, the respiration being continued, these feelings diminished gradually, and were succeeded by a sensation analogous to gentle pressure on all the muscles, attended by a highly pleasurable thrilling, particularly in the chest and in the extremities. The objects around me became dazzling, and my hearing more acute. Towards the last inspiration the thrilling increased, the sense of muscular power became greater, and at last, an irresistible propensity to action was indulged in. I recollect, but indistinctly, what followed. I know that my motions were various and violent.

"These effects very soon ceased after respiration. In two minutes I had

recovered my natural state of mind. The thrilling in the extremities continued longer than the other sensations."

This gas has been breathed by a great number of persons, and almost every one has observed the same things. On some few, indeed, it has no effect whatever; and on others, the effects are always painful.

Mr. James Thomson. Involuntary laughter, thrilling in his toes and fingers, exquisite sensations of pleasure. A pain in the back and knees, occasioned by fatigue the day before, recurred a few minutes afterwards. A similar observation, we think, we have made on others; and we impute it to the undoubted power of the gas to increase the sensibility, or nervous power, beyond any other agent, and probably in a peculiar manner.

Mr. Robert Southey could not distinguish between the first effects, and an apprehension of which he was unable to divest himself. His first definite sensations, were a fullness and dizziness in the head, such as to induce a fear of falling. This was succeeded by a laugh, which was involuntary, but highly pleasurable, accompanied with a peculiar thrilling in the extremities; a sensation perfectly new and delightful. For many hours after this experiment, he imagined that his taste and smell were more acute; and is certain that he felt unusually strong and cheerful. In a second experiment, he felt pleasure still superior; and has once poetically remarked, that he supposes the atmosphere of the highest of all possible heavens to be composed of this gas.

Mr. Wedgwood breathed atmospheric air first, without knowing it was so. He declared it to have no effect, which confirmed him in his disbelief of the power of the gas. After breathing this some time, however, he threw the bag from him, and kept breathing on laboriously with an open mouth, holding his nose with his left hand, without power to take it away, though aware of the ludicrousness of his situation; all his muscles seemed to be thrown into vibrating motions; he had a violent inclination to make antic gestures, seemed lighter than the atmosphere, and as if about to mount. Before the experiment, he was a good deal fatigued by a long ride, of which he permanently lost all sense. In a second experiment,

nearly the same effect, but with less pleasure. In a third, much greater pleasure.

The effects of a gas containing more than its natural proportion of oxygen have already been noticed, both upon vegetable and animal life; and it is so stimulating upon the respiratory organs, as to have endangered and even produced inflammation, when unduly or injudiciously employed. That azote, and carbonic acid gases, breathed without any admixture, are speedily fatal to life, has also been made evident by a variety of experiments and observations—we have already mentioned the destructive effects upon dogs, consequent upon these animals breathing the air of the *Grotto del Cano*; and when faintness, or suspended animation is caused by holding the heads over the fermenting vats of brewers, the cause here in operation is the same, *viz.* the inhalation of carbonic acid gas, and that the taking into the lungs of hydrogen gas is followed by marked results, the following, from among many other instances, may be adduced in proof:—

Maunoir was one day amusing himself with Paul at Geneva, in breathing pure hydrogen air. He inspired it with ease, and did not perceive that it had any sensible effect on him, either in entering his lungs or passing out. But after he had taken in a very large dose, he was desirous of speaking, and was astonishingly surprised at the sound of his voice, which was become soft, shrill, and even squeaking, so as to alarm him. Paul made the same experiment on himself, and the same effect was produced.

It may be said in objection to proposed medicinal trials of factitious kinds of air, founded upon these and other observations, that their effects are too transient and uncertain for any practical inference that might otherwise be deduced from them; but it should be recollected, that even medicinal substances taken into the stomach produce only temporary excitation; and the degree of uncertainty that accompanies medical agency altogether is proverbial. In giving it, however, as our opinion, that more might be made of pneumatic medicine than the fashion of the present day inclines men to believe, we protest against any mis-

use that may be made of our admissions, by unwarrantable enthusiasm, or bungling indiscrimination.

But it was not only on air artificially produced, but on that presented by the hand of nature at once, that speculation grew out of pneumatic discoveries; and air was talked of for the sick, as being more oxygenous, or more azotic, or more hydrogenous, according to the several circumstances of individual requirement. On this hand, however, much of what was not only crude and inapplicable, but absolutely fallacious, was conceived and propagated.

The physical or medicinal qualities of the air have occasioned numerous disquisitions. But extensive inquiries, the tables of mortality, and experience long continued, have allowed us to draw few conclusions that will bear the test of careful examination. In spring we find inflammatory complaints, in autumn bilious diseases; in every season fevers, in the commencement inflammatory, in the conclusion more or less of an opposite kind.

Philosophers have taught us how much pressure we bear from the atmosphere; and of course from the diminution of that pressure we shall feel the want of tension or tone, which results from the removal of any support. Thus, when the air is lighter, we find a languor come on—when heavier, we find our spirits are more brisk and lively. The whole, however, is not owing to the absolute weight of the air, but in part to its elasticity, or rather our feelings of health and activity are in the compound ratio of both. Thus, at the height of from 1200 to 2000 feet above the level of the sea, the pressure is greatly diminished; but we feel increased activity, as we are in general above the region of the clouds; and the air is more elastic, and the languor felt in very high situations is not uniform or constant, so that it cannot depend on a constant cause. During rain, the mercury in the barometer is not depressed half an inch, yet we feel more languor than on the tops of mountains, where it has probably fallen from five to ten inches.

A dry elevated spot, on a gravelly soil, is said to be most wholesome, especially if sheltered from the east wind. Elevation is however relative; light clouds float in the atmosphere,

about 1000 feet above the level of the sea, and the healthier spot is said to be some way above this elevation. This, however, appears to be fanciful; and it has not been proved that atmospheric moisture alone is injurious. In dry gravelly elevated spots, experience has fixed the most salutary residence for consumptive cases; yet, in these oxygen seems to abound, which is peculiarly injurious in such complaints, and air of a lower quality, as it has been styled, is seemingly as good, and in the opinion of some preferable. In asthmatic cases, elevated spots are manifestly injurious. In fact, theorists may declaim, but facts contradict the most plausible declamations. A change is often necessary; and from the effects of the change, the conduct proper for each individual must be ascertained.

It is observed by some authors, that vaults, corn magazines, and apple garrets, &c. should open to the north; for that point is invariably proper, but the south and west are constantly improper. The most healthy exposure, if a house is to be built, is said to be found by cutting one of the trees that grew there transversely with a saw, observing the rings; the side of the tree on which the distances between each ring is widest, is the most healthy exposure, and the windows of the house, all other circumstances being the same, should ever face that way.

The aerial pathology has not yet been successfully cultivated. Man can live and enjoy health from the heat of 28 to 108 degrees of Fahrenheit. He can exist in a constant fog, where the hydrometer proceeds beyond the extreme of humidity, and in air which supports the mercury only at 22 or 23 inches, he is robust and active. Sudden changes are injurious; but the injuries are often transitory or inconsiderable, or if severe, producing only temporary or acute diseases. Yet the air is charged with being the cause of numerous diseases, and it really is so. Sudden cold, checking perspiration, will apparently produce almost every form of the pyrexia. Partial cold will produce rheumatisms; damp air catarrhs; and in old people those diffusions which are called humours, as asthmas and catarrh, suffocavit.

The continued heat of summer occasions bilious disorders, and the cold of winter, a return of the more active in-

flammations. The air, however, is chiefly a vehicle of injurious effluvia, some of which can only be ascertained.

Marsh miasmata, as they are styled by pathologists, are the causes of numerous intermittent and remittent fevers, as well as those apparently of a more continued form. It has been ascertained that a clayey soil, when moistened, will attract the oxygen of the air, and leave the azotic part not sufficiently guarded to support the *vis vitæ*; and it is found that districts become unhealthy, chiefly when the earth begins to appear in consequence of a diminution of the water. It is singular that Linnæus, with a view to prove the cause of intermittents to be an argillaceous earth, has traced very minutely the prevalence of intermittents in clayey countries, a circumstance which may be explained from the views just assigned. To this diminution of the oxygen must be added a larger and unusual proportion of inflammable air from the parts of marshes still covered with water. To these conjoined causes many epidemics are owing, and when the changes in the physical properties of the air appear to produce fevers, they act only as exciting causes of these miasmata.

AIR CELLS, in plants, are cavities in the leaves or stems, or other parts, containing air. In water-plants they have a very definite form, and are built up of little vassicles of cellular tissue, with as much regularity as the walls of a house; they no doubt enable the plant to float. Their anatomical structure frequently exhibits one of the most beautiful of microscopic objects. In plants which do not float, their form is less definite; they often appear to be mere lacerations of a mass of cellular substances, and their object is unknown; well-known instances of their presence are the chambers in the pith of the walnut-tree, and the tubular cavities in the stem of the bamboo, and other grasses.

AIR-PLANTS are so called because they possess the peculiar property of living for a considerable period, if suspended in air without being in contact with any substance, from which they can absorb food.

There are two different tribes to which the name of air-plants has been applied; the first containing the moss-

like *Tillandria usneoides*, which makes such a beautiful appearance in the hot damp forests of tropical America, where it is seen hanging in festoons from the branches of the trees; and the *T. xiphioides*, the fragrance of which induces the inhabitants of Buenos Ayres to adorn the balconies of their houses with it. This tribe is called by botanists *Bromeliaceæ*.

The other tribe, which is named *Orchideæ*, is the one to which the gardener has hitherto almost exclusively turned his attention. There are several species in this tribe which will be treated of under their different heads, but the one to which the name of air-plant is most justly due, is that of the *aërides*, which contain several species.

Dr. Lindley remarks, "till within a few years, the cultivation of air-plants of the *Orchis* tribe was supposed to be attended with insuperable difficulties; and of the many hundreds of beautiful species that are found in foreign countries, scarcely any were known in Europe, except from drawings, bad descriptions, and imperfect dried specimens. The method of growing them was so entirely unknown, that no one ever expected to preserve a species beyond a few months after its importation. The application of physiological principles, has, however, at length overcome all difficulties, to so great a degree, that *orchideous* air-plants have become comparatively common in the hot-houses of the lovers of beautiful flowers; and there appears little reason to doubt, that in a few years it will be as common to see them suspended in the drawing-rooms of the richer inhabitants of this country, as they have long been in the houses of the Chinese, a purpose for which the surpassing beauty and delicious fragrance of many render them particularly well adapted.

"The native country of these curious plants is, wherever a climate is found in which heat and moisture are in excess. Within the tropics in Asia, Africa, and America, in damp and shady forests, by the side of fountains, within reach of the spray of waterfalls, perched upon the branches of trees, or clinging to rocks and stones, by means of their long and withering roots—creeping among moss, rearing their flowers in the midst of brakes, and other moisture-loving tribes—in all such situations they are found in abun-

dance. But in those regions where the heat is accompanied by periodical dryness, as the open plains of India, and the sandy deserts of Arabia and Africa, they are almost entirely unknown. The principal stations for them are the woods of Brazil and Peru, the lower mountains of Mexico, the West Indies, Madagascar, and the adjoining islands, the damp jungle of Nepal, and the whole of the Indian Archipelago; in Java alone, nearly 300 species have been discovered. In that country they are described as overrunning the trees by thousands in mountain forests, choked up by huge climbers, and a rich undergrowth of gigantic grasses, while not a ray of sun-light can enter to dispel the damp and gloom.

"Such are the conditions under which air-plants of the kind now described naturally thrive; 1st. high temperature; 2nd. diffused light, like that of a shady grove, and not direct solar light; 3rd. a great degree of dampness; and 4th. a perfect freedom from stagnant water round their roots: for on the trunks of trees, or on stones and rocks, no water can lodge, and all the moisture they receive must necessarily be in the form of vapour or falling rain. And it is to circumstances of this nature that the gardener has chiefly to attend. Damps, shade, heat, and good drainage will be his objects; the three former will cause him no trouble, but the latter will require him to alter entirely his usual mode of cultivation. Instead of considering in what kind of soil his air-plants are to be placed, he will endeavour to dispense with soil, and to supply its place with bits of rotten wood, chopped moss in very small quantities, fragments of half baked pottery, such as garden pots and the like. These are the points which enable modern gardeners to obtain a certain degree of success."

AERIDES (derived from *aër*, the air; in allusion to the peculiar property the species possess of existing many months in that element).

The true species of this genus are beyond all comparison the most delightful productions of the vegetable world. Their flowers are arrayed in long spikes or racemes of delicate colours and delicious fragrance. Hung up in a room in their native country, a little before flowering, they continue to unfold their blossoms in gradual succession for

many weeks. In this country they are at present rarely seen in flower.

Class 20, 1. Gynandria Monandria. Nat. Ord. Orchidææ.

The characters are—*Lip spurred or saccate, inserted at the end of the unguitiform process, to whose edges the anterior sepals are united. Pollen masses two, two-lobed behind, fixed by a common process to the middle of the stigma.*

1. *ÆRIDES ODORATUM* (fragrant air-plant). *Spur ascending conical, subulate, middle lobe of lip shorter than later ones, leaves blunt.*

2. *ÆRIDES ARACHNITES* (spider air-plant). Kœmpf. t. 869, fig. 1. *Stem branched rooting; leaves lanceolate; sepals revolute, dilated at the end; lip bifid in front.*

Sweet observes, "*Ærides odoratum* should be planted in rotten wood with a little peat, or in a few decayed leaves, or any bright black vegetable mould, and kept in the hottest and dampest place of the stove. If put in baskets among moss and kept very damp, the plants will succeed for a short time, but they soon languish and put on a yellow appearance, the certain indication of unhealthiness." Mr. Fairbairn, when gardener to Sir Joseph Banks, at Spring Grove, in 1813, flowered the *Ærides odoratum* very finely by the following treatment: "I put the plant, when first received, into a basket with old tan and moss, and hung it up in the pine house, where it was exposed to the summer sun, and to the fire heat in winter; a tub of water was placed near it, so that I could take down and plunge the basket six or seven times a day, or as often as I passed it."

AIR-VESSELS, certain canals, or ducts, whereby a kind of absorption and respiration is effected in vegetable bodies.

Air-vessels have been distinguished from *sap vessels*; the former being supposed to correspond to the trachea and lungs of animals: the latter to their lacteals and blood vessels.

Dr. Grew, in his inquiry into the motion and cause of the air in vegetables, shows that it enters them in various ways, not only by the trunk, leaves, and other parts above ground, but also at the root. The pores designed for the reception as well as expulsion of air are so very large in the trunks of some plants, as in the better sort of thick walking canes, that they are visible to a good eye without a glass; but with a

glass the cane seems as if it were stuck full of large pin-holes resembling the pores of the skin in the ends of the fingers and ball of the hand. In the leaves of the pine, through a glass, they make an elegant appearance, standing almost exactly in rank and file throughout the length of the leaves.

But though the air enters in partly at the trunk and also at other parts, especially in some plants, yet its chief admission is at the root; much as in animals, some part of the air may continually pass into the body and blood by the pores of the skin; but the chief draught is at the mouth. If the chief entrance of the air were at the trunk, before it could be mixed with the sap in the root it must descend; and so move not only contrary to its own nature, but in a contrary course to the sap: whereas by its reception at the root, and its transition from thence, it has a more natural and easy motion of ascent. (See *Circulation of Sap*).

The same fact is further deduced, from the fineness and smallness of the diametral apertures in the trunk, in comparison of those in the root; which nature has plainly designed for the separation of the air from the sap, after they are both together received into them. *Grew, Anat. of Root*, chap. iii. p. 127.

Air-vessels are found in the leaves of all plants, and are even discoverable in many without the help of glasses; for upon breaking the stalk or chief fibres of a leaf, the likeness of a fine woolly substance, or rather of curious small cobwebs, may be seen to hang at both the broken ends. This is taken notice of only in some few plants, as in *scabious*, where it is more visible: but may also be seen more or less in most others, if the leaves be very tenderly broken. This wool is really a skein of air-vessels, or rather of the fibres of the air-vessels, loosed from their spiral position, and so drawn out in length. *Id. ibid.* chap. iv. p. 155.

Dr. Hales, in his *Statical Essays*, (vol. i. p. 155, &c.) has fully proved that air is inspired by vegetables, and has shown that air, in many instances, freely enters the vessels of trees, and that it is wrought in great abundance into their substance. But as to the particular air-vessels in plants, he seems to speak doubtfully. He asks, may not the use of those spiral wreaths, that are coiled round the insides of those vessels,

which are supposed to be air-vessels, and which are manifestly to be seen in several trees, and also in the leaves of the vine and scabious, be designed by nature to promote the quicker ascent of air by being in some measure conformed to its elastic contortions? For such spiral wreaths seem to be altogether useless, for promoting the ascent of any liquor, as the sap, which ascends most freely through innumerable other capillary vessels, having no such spiral coils in them: not that we are to suppose the air in its elastic state actually to touch, and thereby to be determined in the course of these spirals, as any liquor would be. But as the rays of light, when they are reflected from a solid body, are found to be reflected, without actually touching the reflecting body in the point of reflection; so it is not unreasonable to suppose that elastic air may, like light, be diverted from one course, and so be determined to another, by the solid bodies it approaches, without touching them, but rebounding like light from those solid bodies near the point of contact.

Dr. Hales has observed, that these spirals are coiled in a course opposite to the course of the sun, that is, from west to east. *Vide Static. Ess. vol. ii. p. 265, 266.*

In the early part of vegetable life, the cellular net-work forms a number of lacunæ, which, when more matured, become a regular series of vessels, which have been described with great care by M. Mirbel. Of course, these tubular vessels exist in the root, where they may be perceived by making a transverse section of it. They differ in monocotyledonous and dicotyledonous plants: in the former they are always found in the middle of woody fibres, or compose the greater part of them; while, in the latter, they appear to be dispersed at random throughout the wood. Sometimes they form regular groupes, at other times they are arranged in concentric belts; and they are particularly abundant around the pith. They pass from the main trunk of the root to all the fibres and appendages, and occasionally form medullary rays.

When the different parts are examined, their particular structure is found to be singular and beautiful. We shall first detail the result of M. Mirbel's examination, which may be considered

as containing the general features of the vegetable structure; and we shall then give the valuable observations of Mr. Knight and others, which afford a more continuous view of the subject. Mirbel describes the vegetable system as composed of cellular substance and tubes (*Tissu cellulaire* and *Tissu tubulaire*), and these he depicts with much minuteness. His own description of the cellular substance is so clear, that we shall, without hesitation, avail ourselves of it. "Ce ne sont point des petites outres ou utricules, comme le disent la plupart des auteurs, c'est une membrane qui se dedouble en quelque sorte, pour former des vuides contigus les uns aux autres. Dans les partie ou ces cellules n'éprouvent aucune pression étrangere, elles sont toutes également dilatées, leurs coupes transversales et verticales présentent des hexagones semblables aux alvéoles, des abeilles; chaque côté de ces figures géométriques sont communs à deux cellules, et tout le tissu est d'une régularité admirable, mais lorsqu'une force étrangere comprime le tissu, les hexagones se deforment et font place quelque fois à des parallelogrammes plus ou moins allongés. Les parois membraneuses des cellules sont tres minces et sans couleur; elles sont transparentes comme le verre; leur organisation est si delicé, que les microscopes les plus forts ne peuvent la faire apercevoir. Elles sont ordinairement criblées de pores dont l'ouverture n'a certainement pas la trois-centième partie d'une ligne, ces pores sont bordés de petits bourrelets inégaux et glanduleux, qui interceptant la lumière et la refractent avec force lorsqu'ils en recoivent les rayons. Le tissu cellulaire est spongieux, elastique sans consistance; plongé dans eau, il s'altère, et même se detruit en peu de tems; il se reduit alors en un espèce de mucilage. Les pores établissent la communication d'une cellule à une autre, et servent à la transfusion des sucs, qui est extrêmement lente dans le tissu. Je dois même observer qu'il n'est pas conducteur des fluides répandus dans le vegetal et qu'il ne produit rien par lui-même."

Mirbel describes four kinds of these large tubes: 1, The simple; 2, The porous; 3, The false air-vessels; 4, Air-vessels.

The first are merely continuous tubes, which commonly contain those resinous and oily juices which are known under

the name of "*proper juices*." This kind is most remarkable in green plants, as in the *Euphorbiæ*, in *Periploca*, and in all plants containing very dense fluids. They are most distinct in the bark.

The coats of the second are penetrated by small holes, arranged in regular parallel series around it. The use of this species is not so well understood. It is found chiefly in hard woods, such as the oak.

The false air-vessels are tubes transversely cut by parallel fissures, which give it the appearance of having been formed by a series of rings placed above each other. These tubes are destined to perform the same functions with the porous tubes. They are most numerous in the vine, the substance of which is extremely porous.

The air-vessels, which appears to be an improper name, resembles the tracheæ of insects. The first are formed by the turnings of fibres from right to left. Mirbel declares that he never could discover from a transverse section any opening of a tube; but that occasionally an ellipse, or the union of two fibres by means of a membrane, were sufficiently distinct. The same author denies the assertions of Malpighi and Reichel, respecting the existence of strictures in the tracheæ, and ascribes their error to optical deception. They are chiefly found around the pith, and in the softer parts of the vegetable. A very simple experiment will exhibit this organ with great distinctness. Take a young branch of any tree, and twist it, and break it partially across; the spiral parts of the tracheæ will then be unrolled, and will be very evident. They will resume their natural appearance when the two ends are brought together, so that they may be allowed to contract. This contraction is well seen in leaves and their foot-stalks, except in those of the *Butomus umbellatus*, which never contracts. They serve also to convey nutritious juices to the plant.

In addition to these larger tubes, there are some which Mirbel calls the small tubes, which are formed by the membranes of the cellular net-work. They appear to regulate the density of the wood; for in proportion to the greater or smaller number that exist in it, will the wood be hard or soft. They commonly contain colourless and limpid juices, and occasionally those that are

coloured and thick. Examples of each of these are to be had in the vine, and in the pine. Such is the result of M. Mirbel's examination of the particular structure of the vegetable.

It is sufficiently obvious, that certain fluids exist in plants; and that these fluids are conveyed from one part to another, at particular seasons of the year, seems also to be perfectly ascertained. This fluid is called the sap, and it is observed to flow more freely before the appearance of the leaves. (See SAP.) An experiment, illustrative of this fact, is easily made on the vine. From this fluid, the various vegetable matters, such as sugar, gum, acids, and others, are formed; it may, therefore, be considered analogous to the blood of animals: our present business is to trace the curious arrangement of the vessels through which it passes.

Much diversity of opinion has appeared on this subject, and it is only very lately that accurate notions have been entertained respecting it. Malpighi and Grew considered the woody fibre, which composes the great body of the vegetable kingdom, as the sap-vessels; and they employed many plausible arguments in support of their opinions. The number, strength, uniformity, and universal distribution, even in the most delicate parts of the plants, were all urged; and, although no tubular structure could be discovered, they were considered as the only vessels, because no other could be detected; and it was certain that a circulation was carried on. Duhamel adopted this opinion; but Tournefort, finding the above difficulty press much upon him, resorted to the very singular theory, that the fluids were conveyed through the plant, by a simple capillary attraction. Darwin, in his *Phytologia*, seems to have given the first hint of the opinion, that what have been taken for air-vessels are really absorbents destined to nourish the plant, or, in other words, sap-vessels.

Dr. Darwin contends, that the vessels which Malpighi, Grew, and many others, have denominated bronchia, and erroneously thought to be air-vessels, and to serve the purpose of respiratory organs, are absorbent vessels, destined to imbibe the nutriment of plants, and that they are the genuine lungs of vegetables. "These absor-

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bent vessels," he says, "which resemble the lacteals of animal bodies, are found in the roots of plants, for imbibing nourishment from the moist earth; on the external surfaces of the bark and leaves, for absorbing the humidity of the atmosphere; and also in the internal surfaces of the cells and cavities of the vegetable system, where they absorb the secreted fluids, after they have performed the offices to which they are adapted. The existence of the first sort of absorbents is evinced by the growth of plants whilst moisture is applied to their roots, and by their withering when it is withdrawn. Those of the second sort are manifested by plucking off a leaf and laying it in water, which is found not to wither so soon as if it were left exposed to the dry air. The third class of vessels of this kind will be perceived to perform its office by moistening the alburnum or sap-wood, and the inner surface of the bark of a branch severed from a tree, which are thus preserved, whilst the same parts left unmoistened in the dry air, are observed to wither. Besides, if vegetables be inserted in glass tubes, or narrow vessels, filled with water, the surface of the water will be seen to subside much sooner than by evaporation alone in similar circumstances."

Dr. Darwin contrived to exhibit these absorbent vessels to the eye, by dipping twigs of a fig-tree in a decoction of madder and of log-wood, which after some time, upon cutting off about an inch of the stalk near the bottom, exhibited a circle of red points, believed by him to be the coloured ends of the absorbents, that existed in the newly-formed alburnum. This ingenious writer expressed his astonishment that any person should have conceived these vessels, that are found in the alburnum, and which consist of a spiral line, to be air-vessels or tubes. He farther observes, that the absorbent vessels of trees, in passing down their trunks, consist of long hollow cylinders, of a spiral form, and of such large diameters, in some vegetables, *e. g.* in cane, as to be visible, when dry and empty, to the naked eye. Through these, air will pass rapidly upward and downward; and hence Dr. Hales has been led to coincide with Grew and others in opinion, that they are air-vessels or

lungs, designed for respiration, and receiving atmospherical air in their natural state.

But to their use as air-vessels, Dr. D. objects, because they have no communication with the horizontal air-vessels of plants, and they exist in the roots as well as in the trunks of plants, where, not being exposed to the atmosphere, they cannot serve the purpose of respiration. Air, however, in its combined state, or dissolved in water, may be absorbed by these vessels; and may appear when the pressure of the atmosphere is removed by the exhausted receiver, or when it is expanded by heat, as is the case in the froth observed at one end of a green stick, when the other is burning in the fire. Dr. Darwin apprehends, that the structure of those large vegetable absorbents, which have been erroneously called air-vessels, consists of a spiral line, and not of a vessel interrupted by valves; and in this respect it differs from that of animal lymphatics.

According to this writer, the proper air-vessels are horizontal vessels of a large diameter, which pass through the bark of trees to the alburnum. Malpighi has given a figure of these vessels, and Duhamel mentions fine horizontal perforations through the bark of trees, which he believes to be perspiratory or excretory organs; and besides these, he takes notice of others, that are larger, standing prominent in the birch-tree, and piercing the exterior bark, which probably contain air during the living state of the tree. Dr. Darwin supposes, that the horizontal vessels first mentioned contain air, inclosed in a thin moist membrane, which may serve the purpose of oxygenating the fluid in the extremities of some fine arteries of the embryo buds, in a manner similar to that by which the air at the broad end of the egg is thought to oxygenate the fluids in the termination of the placental vessels of the embryo chick.

Knight has confirmed this opinion by a series of ingenious experiments, conducted with his wonted accuracy and fidelity. By breaking gently a twig of a young tree, and by separating the two parts, the vessels will be observed to connect the broken extremities even by the naked eye. The vessels are called, by Willdenow, the adductent res-

sels (*vasa adducentia*), and by Mr. Knight, the central vessels. They are also the tracheæ or air-vessels of Mirbel and others. They have a spiral form, and have not hitherto been seen on the bark; nor do they appear at the more advanced stage of a branch in which they formerly abounded, for they become woody when the parts grow older. Besides the central vessels, Mr. Knight has described another set that traverse the alburnum, whence they are distinguished by the name of *Alburnous*. Through them the sap also ascends, for the destruction of a circle of bark does not prevent the formation of buds and leaves; "but," says Mr. Knight, "the alburnous vessels appear to be also capable of an inverted action, when it becomes necessary to preserve the existence of the plants." The cortical vessels of Mr. Knight, which can scarcely be considered the same with the *vasa reducentia* of Willdenow, although they are said to perform the same function, exist in the bark, and serve to re-convey the circulating sap to the root. It is suspected that there may be two sets of these vessels, one which nourishes the bark, and another that secretes particular fluids in the bark. Lymphatic vessels have also been described; but without any satisfactory account.

The functions of the vessels of plants have been as variously described as the organs themselves. Malpighi supposed them to be air-vessels; Grew declares that they sometimes contained moisture; and Duhamel suspected that they contained "highly-rarefied sap." The experiments already alluded to, of Darwin and Knight, have, to a certain degree, determined their uses. The former placed twigs of the common fig-tree into a decoction of madder; and, on taking them out, after some hours' immersion, and cutting them across, the coloured fluid was found to have ascended into each branch, and the cut ends of the vessels formed a circle of red dots around the pith, and these vessels again were surrounded by other vessels, containing the milky juice so very remarkable in the fig-tree. The latter (Mr. Knight) made similar experiments with cuttings of the horse-chestnut, and of the apple-tree, with an infusion in water of very black grapes: the result corresponded with those of

Dr. Darwin. He, however, pursued the investigation still further, and traced the fluid into the leaves; and during the whole course it did not give the slightest tinge to the bark, nor to the sap between it and the wood. The pith was very slightly, if at all affected. The radicles are probably elongations of these vessels, which absorb the proper fluids from the earth, and convey it into the body of the root, where it becomes sap by some process which we cannot develop. It is then conveyed to the stem and leaves, where certain other changes take place that are to be hereafter noticed. The functions of the alburnous vessels appear to be twofold, according to the views of Knight. At one period they convey sap to the leaves in common with the central vessels: and during the winter, they serve as reservoirs of the juices of the plant, which, having undergone certain changes in the leaves, are there deposited until the approach of spring, when they contribute to the formation of those new parts which are necessary for the living action of the vegetable. The cortical vessels seem to carry the sap back to the roots through the bark, and, in its course, it possibly forms *alburnum*, or at least furnishes the materials. All this however is mere probability, as we know very little with certainty connected with it.

It is difficult to determine by what means the sap is propelled through the vessels: the agitation of the winds, the form of the vessels, the action of heat, the pressure of certain plates, called silver grain in the oak, are all supposed to contribute to this end; and very possibly they do this to a certain extent. We confess, however, that these do not appear to our mind to be adequate causes. It is a matter of some moment to ascertain how the function is performed; but our knowledge of facts is so imperfect, that it is impossible to frame even a reasonable hypothesis on the subject. In this, as in every other department of physics, men are too prone to step beyond the limits within which their actual knowledge should confine them.

AIR (*αἶρ* of Hippocrates and Theophrastus), hair-grass. Applied by the Greeks to our *lotium temulentum*. It signifies "something deadly," in allusion to the dangerous effects of that

plant; but the name has no reference to any species of the genus to which it has been applied by Linnæus.

Class 3, 2. Triandria Digynia. Nat. Ord. Gramina or Grasses.

The characters are—*Calyx a two-flowered, two-valved glume; the valves ovate-lanceolate, acute and equal; the corolla bivalve, the valves like the former; nectary two-leaved, leaflets acute, gibbous at the base; the stamina have capillary filaments, of the length of the flower, with oblong anthers, forked at each end; the pistillum is an ovate germ, the styles setaceous spreading, with pubescent stigmas; no pericarpium; the seed subovate, crowned with the corolla.*

It differs from *MELICA*, in having no rudiment of a third between each pair of floscules, the number of which varies. Martyn enumerated 14, and Gmelin, in his edition of Linnæus, 25 species; some of which are naked or awnless, and others awned.

NAKED OR AWNLESS.

1. *AIRA ARUNDINACEA* (reedy aira, or hair-grass). *Panicle oblong, on one side, imbricate; leaves flat.*—It is found in the Levant and in Cochin China.

2. *AIRA MINUTA* (minute hair-grass). *Panicle loose, almost level-topped, very branching.*—This is an annual grass, scarcely an inch high, found in Spain. It differs from that which is figured by Buxbaum, only in being much smaller.

3. *AIRA AQUATICA* (water hair-grass), Eng. Bot. 1557. *Panicle spreading; flowers smooth, longer than the calyx; leaves flat.*—This grass generally grows in the margins of pools and watery places, running in the water to a considerable distance, and is known by the purple or bluish colour of the panicles, and sweet taste of the flowers: perennial, flowering in May and June. This, says the author of the *Farmer's Dictionary*, is the grass which contributes chiefly to the sweetness of Cottenham cheese, and the fineness of Cambridge butter. *Aira aquatica* is much relished by cattle, and water-fowls are so particularly fond of the young shoots and seeds, that it is introduced in decoys, by throwing plants in the water with a weight tied to them.

There is a variety of this which grows in dry soils, with the calyces

five-flowered, and the flowers very remote from each other. It occurs in sandy lands near Exmouth, about Northfleet, in Kent, in Lancashire, and Yorkshire. In Dr. Withering's arrangement it is the *poa distans*; and Dr. Stokes suspects the *poa retrofracta* of Mr. Curtis to be the same with this.

4. *AIRA CAPENSIS* (Cape hair-grass). *Culm ramose; flowers racemous; corolla hairy.*

5. *AIRA KOENIGII* (Koenig's hair-grass). *Panicle dense; calyces smooth; subflorous culm, a foot high, ascending, leafy; upper leaves scarcely shorter than the culm, naked, linear, acute; flowers numerous, minute.* A native of the East Indies, whence it was sent by Koenig. It is the *poa biflora* of some authors.

6. *AIRA BENGALENSIS* (Bengal hair-grass). *Panicle erect; pedicles three-flowered; petals woolly within.*—A native of Bengal. It is the *Arundo Bengalensis* of other writers.

7. *AIRA MILLIACEA*. *Panicles very numerous; floscules in three's; obtuse and distinct; leaves smooth striated.*

8. *AIRA ÆGILLOIDES*. *Flowers turned to one side, with one valve of the corolla ovated and acuminate, and the other columnar and obtuse.*

Dr. Smith (Flor. Brit. vol. i. 84) adds, *AIRA CRISTATA*, with panicle spicated; calyces longer than the peduncle; petals acuminate and unequal.—It grows in high barren pastures and walls, perennial, flowering in July and August.

AWNLESS.

9. *AIRA TRUNCATA* (Pennsylvanian hair-grass), Act, petr. 11. t. 7.—*Beardless; panicle lanceolate; lax erect; one floret stalked above, the other sessile; leaves pubescent.*—A perennial native of North America, where it flowers in June and July. Introduced in 1819.

10. *AIRA SUBSPICATA* (spiked hair-grass). *Leaves flat; panicle spiked; flowers awned on the middle; awn reflex, loose.* A perennial, found on the mountains of Switzerland, Savoy, Denmark, and Lapland.

11. *AIRA CÆSPITOSÆ* (turfy hair-grass.) Eng. Bot. 1453. *Leaves flat; panicle spreading; petals villous, and awned at the base; awn strait and short.*—Growing in moist meadows and

woods, perennial, flowering in June and July, sometimes trailing on the ground to the length of several feet, and the panicle exhibiting a beautiful purple silky appearance. Dr. Withering mentions a variety of this with panicle viviparous, flowering in October, and found on Highland mountains. This is apt to grow in tufts, and occasion irregularities in the surface of meadows. Cows, goats, and swine eat it; but horses are not fond of it. It is the roughest and coarsest grass that grows in pastures or meadows; and cattle will not touch it, unless compelled by hunger. It is called by the vulgar, *hassocks*, *rough-caps*, and *bull's faces*. To get rid of it, the land should first be drained, and the tufts of this noxious weed pared off and burnt; and the ashes they yield will be a good manure.

12. *AIRA FLEXUOSA* (waved mountain hair-grass). Eng. Bot. 1519. *Leaves setaceous; culms almost naked; panicle spreading trichotomous; peduncles flexuose, and awns geniculated.*—Perennial; flowering in July, and growing in heaths, woods, and barren pastures; is eaten by horses, kine, and sheep. Dr. Withering suggests, that this is a variety of the *A. montana*, or rather the same in a more mature state. This is a principal grass on Banstead Down, Mendip, &c. and is equally fine and nutritive with sheep's fescue. It is of difficult cultivation. Dr. Smith (Fl. Br. vol. i. p. 85) mentions two varieties; one with a panicle, less spreading, and peduncles scarcely flexuose. This is the *A. montana* of Hudson, Withering, Relhan, and Leers, but not of Linnæus. The *A. setacea* of Hudson does not differ from this; but the *A. montana* of Linnæus is a very different grass, and has not yet been found in Britain. The other has a culm more leafy, a white panicle, scarcely flexuose, and grows in shady places.

13. *AIRA MONTANA* (mountain hair-grass). *Leaves setaceous; panicle narrowed; flowers hairy at the base and awned; awn twisted and very long.*—It is supposed to be but a variety of the former; a perennial; flowering in July and August. A native of high heaths and sandy pastures; eaten with avidity by sheep. A variety, called *setacea*, with awns twice the length of the florets, is mentioned by Hudson.

14. *AIRA ALPINA* (Alpine hair-grass).

Leaves subulate; panicle dense; flowers hairy at the base and awned; awn short.—Grows on the mountains of Germany, Savoy, and Lapland.

15. *AIRA VILLOSA* (villose hairy-grass). *Leaves subulate; panicle long and narrow; flowers sesquialteral, shaggy, awned; awn straight and short.*—Found by Thunberg at the Cape of Good Hope.

16. *AIRA CANESCENS* (gray hair-grass). *Leaves setaceous; culm leafy, the upper one involving the panicle at bottom, like a spathe; awns clavated at the apex, shorter than the calyx.*—A native of sandy shores, on the coasts of Norfolk and Suffolk, the walls of Basil, and the sandy fields of Germany and Piedmont; perennial, flowering in July; the *Avena canescens* of Wiggers.

17. *AIRA PRÆCOX* (early hair-grass). *Leaves setaceous; sheaths angled; flowers panicle-spiked; floscules sessile; naked at the base and awned on the back.*—Found on dry commons, in ditches, on banks of streams, and in wet meadows; perennial, flowering in May and June, ripening its seeds in June; and called by Wiggers, *Avena pusilla*. It has a sweet taste; cows are very fond of it; and it is eaten by horses and sheep.

18. *AIRA CARYOPHILLEA* (silver hair-grass). Eng. Bot. 812. *Leaves setaceous; panicle divaricated, trichotomous; floscules sessile; dorsal awn geniculated.*—A native of sandy pastures and heaths of England, France, Switzerland, Piedmont, Germany, and Denmark; annual, flowering in July.

19. *AIRA ANTARCTICA* (South-sea hair-grass). *Leaves flat; panicle compound, spreading; calyces three-flowered; floscules awned in the middle; awn elongated straightish.*—A native of New Zealand.

20. *AIRA INVOLUCRATA*. *Panicle spreading, involucre with bristles at the base; floscules awnless.*—A native of Spain, on barren hills near Madrid; annual, and flowering in June and July.

21. *AIRA PALUDOSA* (marsh hair-grass). *With flat leaves; patent panicle; floscules hairy at the base, and the awn short and bent inwards.*

22. *AIRA FESTUCOIDES* (fescue-like hair-grass). *With filiform leaves; erect panicle; leaves coloured, and awned beyond the middle.*

23. *AIRA JUNCÆA*. *With leaves subu-*

late; panicle patent, very obtuse; awn from the base, of the length of the calyx.

24. *AIRA SINENSIS* (Chinese hair-grass). With setaceous leaves; erect panicle, and villous floscules.

25. *AIRA MEDIA*. With setaceous leaves; narrow panicle; floscules hairy at the base; awn subterminal, shorter.

26. *AIRA PURPUREA* (purple hair-grass). With leaves subulate-setaceous; panicle scattered; one valve of the corolla entire; plumose, and culm erect.

27. *AIRA PULCHELLA* (pretty hair-grass). Panicle divaricating; branches trichot; Flor. 3-flowers larger than glumes; beard jointed, longer than glumes; leaves setace.

28. *AIRA LÆVIGATA* (smooth-sheathed hair-grass). Eng. Bot. 2102. Panicle close; petals awned, hairy at the base; partial stalk smooth and very short; leaves flat, with very smooth sheaths.—This species was first detected by Mr. George Don, who found it on the high mountains of Clova, in Angusshire, as well as at the sea-side near Dundee, and who first distinguished it from *A. cæspitosa*, of which Linneus, who had the same from Lapland, thought it a viviparous variety. According to Mr. Don's remark, it is not viviparous by the sea-side. It is perennial, flowering in May or June.

The differences observed by Mr. Don, between this plant and the *cæspitosa*, are, that it is never above half so tall, even when cultivated; and that the sheaths and backs of the leaves are remarkably smooth. The most essential difference, however, we find in the *rachis* or partial stalk, which elevates one of the florets, and which is extremely short and quite smooth, though at the very base of the outer valve of the corolla there is a small tuft of hairs. In *A. cæspitosa* the whole *rachis* is hairy, and twice or thrice as long.

"*Airæ* genus," says Mr. Brown, "mere artificiale est, plantas complexas ad genera tria vel quatuor diversa accedentes seu omnino pertinentes, vix ulla tamen character *Eriachnes* respondents." Prodrômus, p. 183.

For the propagation and culture of *Aira*. See GRASS.

AIROPSIS (a word formed by M. Desvaux, from *aira*, and *opsis*, like the genus resembles *Aira* in appearance). Class 3, 2. Triandria Digynia, Nat. Ord. Gramineæ.

The characters are—*Glume* two flowered; valves nearly equal, navicular longer than the florets; lower paleæ trifid at the end, upper entire; seed loose, not furrowed; panicle contracted, compound.

1. **AIROPSIS INVOLUCRATA** (involucred airopsis). Can. ic. t. 44. f. 1. Panicle spreading with a setaceous involucre; florets beardless.—This species is an annual grass found in Spain, where it flowers in June and July.

There are some other species which it would be useless to enumerate, as they are not possessed of any qualities that would justify their introduction here. They are increased by seed sown in common garden mould.

AITONIA (so called from Mr. W. Aiton, his majesty's late gardener at Kew, a native of Scotland, born in 1173, having been trained betimes in the science and practice of horticulture, he came into England in 1754, and was engaged as an assistant by Mr. P. Miller, well known as the author of the *Gardener's Dictionary*, who was then superintendent of the Physic-garden at Chelsea. In this situation he soon attracted notice, and in 1759 he was recommended to the Princess Dowager of Wales, as a fit person to manage the Botanical garden at Kew. In this office, to which he was then appointed, he continued during life; and here he laid the foundation both of his fame and fortune. As the garden at Kew was destined to be the repository of all the curious plants, that could be collected from the various quarters of the globe, Mr. Aiton had the most favourable opportunity for indulging his taste, and employing his care and skill in their cultivation; and in so doing he acquired distinguished reputation amongst the lovers of this science, and the particular esteem of his royal patrons. Under his superintendence Kew Gardens became the principal scene of botanical culture in the kingdom. In 1783 Mr. Aiton was promoted to the more lucrative office of managing the pleasure and kitchen gardens at Kew, which he was allowed to retain in connection with the botanical department which he had before occupied. In 1789 he published his "*Hortus Kewensis, or Catalogue of the Plants cultivated in the Royal Botanic garden at Kew,*" in three vols.

8vo. with 13 plates; a work which had been the labour of many years, and which justly entitles him to respectful commemoration among the promoters of science. The number of species, contained in this *Catalogue*, is between 5 and 6,000. A new and curious article in it relates to the first introduction of particular exotics into the English gardens. The system of arrangement is that of Linnæus, with such improvements as the advanced state of botanical science required. To Sir Joseph Banks, Dr. Solander, and Mr. Dryander, Mr. Aiton respectfully acknowledges his obligations for assistance in compiling his celebrated work. *The Hortus Kewensis* was much valued by the best judges, and a large impression of it found a rapid sale. Notwithstanding the temperance and activity of Mr. Aiton, he laboured under the incurable malady of a scirrhus liver, which occasioned his death in 1793, in his sixty-second year. The private character of Mr. Aiton was highly estimable for mildness, benevolence, piety, and every domestic and social virtue. He was interred in the church-yard of Kew, amidst a most respectable concourse of friends. His eldest son, devoted to the same pursuits, and distinguished by his talents, was appointed, by the king's own nomination, to all his father's employments.)

Class 16. 4. Monadelphia Octandria.

Nat. Ord. *Columniferae*.

The characters are—*That the calyx is a one-leaved, erect, four-parted, short perianthium, divided into four ovate, sharp segments; the corolla has four erect, equal, broadly-ovate, concave, very obtuse petals; the stamina have filaments, joined as far as the middle, divided above into eight, awl-shaped, furrowed, standing out of the corolla, and having ovate, furrowed anthers; the pistillum has a germ superior, ovate, smooth, subangular, style one, filiform, of the same length, with the stamina, stigma obtuse, undivided; the pericarpium is an ovate dry, membranaceous, four-cornered, one-celled, brittle berry, the corners are produced and sharp: the seeds many, fixed to a column, globular and smooth. It varies with five-cleft, ten stamened flowers.*

AITONIA CAPENSIS (Cape aitonía).

Bot. Mag. 173. *The only species.*—*The Aitonía Capensis* was found at the

Cape by Thunberg, and introduced here in 1774 by Mr. F. Masson. It has a shrubby stalk, six feet high, and a fruit resembling that of the winter-cherry. With us it is of slow growth and seldom exceeds three feet in height. At a sufficient age it produces flowers and fruit through the greatest part of the year. It is raised from seeds, and must be kept in the green-house or Cape-stove.

"A pretty genus," Sweet observes, "which thrives well in an equal mixture of sandy loam and peat. Young cuttings will root in sand, under a bell glass, plunged in heat. The cuttings must not be put in very close together and the glass must be wiped frequently, as they are apt to damp off."

Messrs. Loddiges says, "It succeeds best planted out in the full ground in a conservatory, in which situation we have had it attain the height of seven or eight feet, flowering throughout the greater part of the year, and sometimes ripening seeds, by which it may be best increased, as it is difficult to get cuttings of it to strike root.

The soil should be sandy peat, and it must be protected from frost."

AIZOON (Αἰζών, *sempervivum* or *ever-living*).

Class 12. 4. Icosandria Pentagynia.

Nat. order of *Succulentæ*. *Ficoideæ* Juss.

The characters are—*Calyx five-parted; petals none; capsule superior, five celled, five-valved; seeds several, roundish, or kidney-shaped.*

1. AIZOON CANARIENSE (Purslane-leaved Aizoon). Bot. rep. 201. *Leaves wedge-ovate; flowers sessile.*—This species is an annual plant and a native of the Canary Island. It must be raised on a moderate hot-bed in the spring; and when the plants are fit to remove, they should be carefully taken up, and planted each in a small pot filled with light fresh earth, and plunged into another moderate hot-bed, observing to shade them from the sun, until they have taken fresh root; after which they must be hardened by degrees to bear the open air, into which they should be removed in June, placing them in a sheltered situation, where they will flower, and ripen their seeds in September, soon after which the plants will perish. [Cultivated in 1731 by Mr. Miller.]

2. AIZOON GLINOIDES (hairy aizoon). *Leaves roundish, cuneiform pilose; flowers sessile; calyx hairy.*—Native of the Cape of Good Hope. Introduced, 1774.

3. AIZOON HISPANICUM (Spanish aizoon) Plant. Grass. 30. *Leaves lanceolate; flowers sessile apetalous.*—Grows naturally in Spain and Africa. This is also an annual plant, whose branches trail on the ground. The flowers have no beauty; these plants therefore are preserved only by those who are curious in collecting rare plants. [A variety of this comes from the Cape, with the stem and leaves shaggy, but the upper surface of the leaf less so. Cultivated in 1728, by James Sherard, M.D.]

4. AIZOON LANCEOLATUM (spear-leaved aizoon). *Leaves lanceolate; flowers paniced.*—This is of humble growth, and perishes soon after the seeds are ripe; grows naturally at the Cape of Good Hope. Introduced, 1759.

The third and fourth may be propagated in the same manner as the first; and when the plants have acquired strength, they may be removed into the full ground; but they require a poor sandy soil, for in rich ground they grow very luxuriant in branches, but will not flower till late in the season, and therefore rarely perfect their seeds; but when they are planted in dry sand, or lime-rubbish, they will be more productive of flowers, and less vigorous in their branches.

[5. AIZOON SARMENTOSUM. *Leaves linear-filiform; panicle dichotomous; flowers solitary, peduncled.*—Brought from the Cape by Sparrman.

6. AIZOON PANICULATUM (paniced aizoon). *Shaggy; leaves lanceolate; flowers sessile; branches erect.*

7. AIZOON PERFOLIATUM (perfoliate aizoon). *Downy; leaves inversely-ovate, conjoined, crystalline-dotted; flowers peduncled.*

8. AIZOON SECUNDUM. *Shag-hoary, herbaceous, procumbent; leaves ovate; flowers sessile, imbricate, one-ranked.*

9. AIZOON FRUTICOSUM (shrubby aizoon). *Shrubby, erect, smooth; leaves lanceolate; flowers sessile.*

10. AIZOON RIGIDUM (stiff aizoon). *Shrubby, procumbent, downy; leaves ovate; flowers sessile, remote.*—These five species are all natives of the Cape of Good Hope, where they were first discovered by Thunberg.

Sweet observes, "The annual and biennial species are best cultivated in small pots (in the green-house) in a mixture of loam and lime-rubbish, and their pots well drained with broken potsherds. They may be preserved several years by being repeatedly raised by cuttings which root freely, planted in the same kind of soil, with scarcely any water given them till they have struck root. The cuttings should lie to dry a few days after they are taken off, before they are planted, or they are apt to rot."

AJUGA (either from *Abigo*; or from *a* and *Juga*, one of Juno's names; both from a supposed power of procuring abortion; which however this plant does not possess).]

Class 14. 1. Didynamia Gymnospermia. Nat. order of *Verticillatæ* or *Labiata*.

Bugula. Tournef. Juss. Mill. Dict. The characters are—*calyx a one-leaved, short perianthium, cut half-way into five clefts, with the segments nearly equal; corolla monopetalous, astringent; tube cylindric and bent in, the upper lip, very small, erect, bifid, obtuse, lower large, spreading, trifid, obtuse, middle division very large and obcordate, side one small; stamina with subulate, erect filaments, longer than the upper lip, anthers twin; the pistillum has a four-parted germ, style filiform, and with respect to situation and length as in the stamina, stigmas two, slender, the lowest shorter; no pericarpium, the calyx, which is converging, fosters the seeds, which are somewhat oblong.*

1. AJUGA ORIENTALIS (oriental ajuga). Dill. elt. t. 53. f. 61. *Leaves ovate; corolla pubescent-resupinate.*—First brought into Europe from the Levant by Tournefort, since observed by Thunberg in Japan, and by Loureiro in Cochin China; cultivated in 1732. Of this there are two or three varieties, differing only in the colours of their flowers. The *Ajuga orientalis* may be propagated by seeds, sown when they are ripe in a pot filled with earth, and placed in a shady situation till autumn, and then removed under a frame. In the spring, they should be transplanted into separate pots. In the hard frost of winter they should be covered. This species may also be increased by offsets (of which it affords but a few), but this is a very slow method.

2. *AJUGA PYRAMIDALIS* (pyramidal ajuga). Eng. Bot. 1270. *Spike a quadrangular villous pyramid, the leaves approximating, the root-leaves very large, the bractæ nearly entire.*—Biennial, flowering in April, or with us later; a native of Italy, France, Germany, Switzerland, Sweden, Denmark, Wales, and Scotland. It has no runners; and differs from the fifth in being more hairy; the spike of flowers longer, and not so close; corolla deeper coloured, and often not variegated with white lines; segments of the calyx longer and narrower; fewer flowers in the whorls; the leaves often brown. This plant makes a very handsome appearance from its flowers being accompanied by large, pale purple obtuse bractæ. The corolla is also purple, variegated with darker streaks and a yellow palate.

3. *AJUGA ALPINA* (Alpine ajuga). Eng. Bot. 477. *Stem simple; cauline leaves as long as radical leaves; leaves smooth, unequally dentated, subuniform, the remoter verticilli bearing many flowers.*—It grows naturally on the Alps, and in mountainous places in Carnarvonshire, Durham, and on the summit of a mountain near Castleton, Derbyshire; admitted into gardens for variety, and propagated by its trailing stalks; requiring a moist shady situation; perennial, and flowering in July. This is the *A. pyramidalis* of Hudson, and the *A. genevensis* of Withering.

4. *AJUGA GENEVENSIS* (Geneva ajuga). Bull. Herb. t. 361. *Radical leaves smaller than cauline leaves.* The Geneva bugle or ajuga, has downy leaves streaked with lines, lowermost narrower, calyces shaggy, bractæ or floral leaves generally three-lobed.—Growing wild about Geneva, and in many of the southern countries of Europe; [cultivated in 1759, by Miller.]

5. *AJUGA REPTANS* (common ajuga). Eng. Bot. 489. *Smooth, with solitary stem, and creeping by runners.*

α *ALBA* (white flowered ajuga).

β *AUBRA* (red flowered ajuga). Perennial, flowering in May; growing in moist meadows, pastures, and woods in most parts of England; becoming somewhat hairy in high and dry situations, with a rounder stem and shorter creepers. Professor Martyn mentions two varieties, one with a white and the

other with a pale purple flower, which grow in several parts of Westmoreland; but they differ only in the colour of their flowers from the blue sort. The common bugle, called by official writers, *consolida media*, or middle consound, was recommended as a vulnerary herb, both internally and externally. For this purpose, infusions of the leaves, or the expressed juice, have been administered; and also as mild astringents and corroborants in fluxes and other disorders. Decoctions of them have been commended by Riverius and others in phthises and internal ulcerations; [but modern surgery neglects it, having learned by experience the inefficacy of vulneraries in general.] Malouin recommends a gargarism of the root in the angina. The roots appear to be considerably astringent, both by their taste and by their striking a black colour with solution of chalybeate vitrol. This is so common wild, that it is seldom admitted into gardens.

[6. *AJUGA DECUMBENS* (Japanese ajuga). *Decumbent and villous; leaves obovate and toothed; with flowers in whorls, small and blue.*—It is classed by Loureiro as a variety of *A. reptans*, and may be increased and treated in the same manner as the *orientalis*.

7. *AJUGA IVA* (musky ajuga). Fl. Græca. 525. *Leaves linear, toothed forwards; flowers axillary solitary.*—A native of the south of Europe. Propagated by seed which should be sown in a mixture of sand and loam. Introduced, 1759.

8. *AJUGA FURCATA*. *Leaves stalked, subcordate, ovate, acuminate, acutely crenate, hairy; thyrses axillary stalked.*—This is an ornamental species; a native of Nepal; requires the protection of a frame. Introduced in 1824.

9. *AJUGA CHAMÆPITYS* (ground pine ajuga). Eng. Bot. 77. *Leaves trifid, linear, entire; flowers axillary, shorter than leaf; stem diffuse.*—It grows in sandy fallow fields in Cambridgeshire and Kent; is annual, and flowers in April and May. The leaves of ground pine are moderately bitter, and of a resinous smell, approaching in this respect, as well as in their external form, to those of the pine-tree. Their virtues are extracted both by water and spirit, but most perfectly by the latter, the aqueous tincture is yellowish, and the spirituous green. The watery ex-

tract is bitter and austere; the spirituous is slightly sweetish and warm. The oil collected by distilling large quantities of the herb approaches in quality to that of turpentine. The leaves are recommended as aperients, and corroborants of the nervous system; and are said to be particularly serviceable in female obstructions, paralytic disorders, and when continued for a long time, in rheumatic, ischiadic, and gouty pains. It was denominated by some of the ancient botanists *yua arthritica*, from its use in arthritic pains. It has been recommended by foreign writers in slow fevers, asthma, and apoplectic seizures; and also in infarctions of the viscera and jaundice; and externally for cleansing and consolidating ulcers, as well as for an antidote to the cancer. But its medical reputation has, in later times, considerably declined. The corolla of this species differs in structure from the genuine species of *Teucrium*; (in which genus it had been placed by Linnæus) for the upper lip, instead of being deeply divided and divaricated, with the stamina projecting between its lobes, is very short and notched, exactly as it ought to be in *Ajuga*, to which genus, called by him *Bugula*, it is therefore referred by Haller. Owing no implicit obedience to any system or laws but those of truth and nature, as far as they are discernible, we adopt his alteration, because we think it a good one. It must be acknowledged indeed that the habit of *chamæpitrys* is unlike the *ajugas* of Linnæus; but his *Teucrium* *iva*, which belongs to the same genus, is the connecting link between them, by its pubescence and the denticulation of its leaves approaching *ajuga alpina*, which is moreover a better aromatic plant.

ALANGIUM (so named by Lamarke, from a slight alteration of one of its Malabar names, *Alangi*).

Class 13, 1. Polyandria Monogynia. Nat. Ord. *Myrtaceæ*.

The characters are—*Calyx* 6-10 toothed, superior. *Petals* 6-10 linear. *Berry* coated 1-3 seeded.

1. **ALANGIUM DECAPETALUM** (sage-leaved alangium. Rhee. Mal. 4 t. 17). *Petals* 10, branches spiny, leaves oblong, lanceolate.—A tree thirty feet in height, native of Malabar; grows on rocky mountains. It is called *Alangi* by the natives. The pulp of its fruit has a

grateful, sweet taste; its flowers are white, and they have a pleasant smell. Introduced in 1779.

2. **ALANGIUM HEXAPETALUM** (six-petaled alangium). Rheed. Mal. 4 t. 26. *Leaves* ovate, lanceolate, acuminate.—This species is also a tree thirty feet in height, a native of Malabar, growing amongst rocks, where it is called by the inhabitants *kara angolam* and *namidon*. The berry, or drupe, is covered with a purple tomentose coriaceous rind. The pulp is red, juicy, and clammy, with rather an acid taste. The nut is one-seeded. Introduced in 1822.

Sweet observes, that "*Alangium* thrives well in a mixture of loam and peat, or light sandy loam. Cuttings root in sand plunged under a hand-glass in moist heat."

ALBUCA (this name is taken from Pliny, and is derived from *albus*, white).

Class 6, 1. Hexandria Monogynia. Nat. Ord. of *Lilia*, or *Liliacæ*. *Coronariæ*, Lin. *Asphodeli*, Juss.

The characters are—*Sepals* six; the inner conniving, the outer spreading, generally with a green stripe at their back; style three-cornered; seeds flat.

1. *Three stamens fertile*.

1. **ALBUCA ALTISSIMA** (tall albuca). Jac. ic. 1. t. 36. *Inner sepals* glandular at end inflexed; leaves subulate, channelled, recurved.—The leaves are so deeply channelled as to be almost rolled into a cylinder; they are two feet long, and almost three inches broad at the base. Scape a little shorter than the leaves, the thickness of a finger. Raceme two feet long and more. Peduncles bent down in flowering time, afterwards spreading and becoming finally erect; they are three inches in length. Bractes green, except at the edge, where they are clear white, an inch long. Flowers white: petals more than an inch in length, the outer sharp and thickened at the tip, inner blunt, bent in, and having a twin gland, composed of two globes, at the end: the fertile filaments are waved on the edge, with the anthers curved inwards beneath the glands of the petals; the barren filaments are triangular, furrowed on the outside, a little longer than the others, and have no anthers. Germ subpedicelled: style obversely pyramidal, the length of the germ, covered with glandulous scales; the angles terminate in subulate horns covered also with scales; the centre is

elongated into a pyramidal stigma. It flowers in April and May, and was introduced about 1780, by Messrs. Kennedy and Lee.

ALBUCA MAJOR (great albuca). Bot. Mag. 804. *Inner sepals, glandular at end, inflexed; peduncles spreading; leaves linear lanceolate; flat, reflexed.*—In this species the scape is a foot high, upright, roundish, very minutely streaked, smooth, ash-coloured, with a glaucous bloom on it. Leaves sharp, smooth, streaked, a foot long. Bractes sheath-form, lanceolate, concave, with a long linear-subulate tip, red, nerved, smooth, straight, solitary, at the base of the peduncles. Raceme terminating, long, crimson, smooth; the flowers alternate, peduncled, slightly nodding, fewer at bottom. Peduncles round, smooth, one-flowered, longer than the bractes, spreading. Petals linear, longitudinally nerved, marcescent; the three outer broader, a little concave, red, blunt at the end, bent in with a small marginal scale; the three inner narrower, upright, pale red, with a broad, thin, membranaceous, whitish rim on each side, and an ovate, membranaceous inflex scale at the tip. Filaments erect, the length of the corolla, linear, membranaceous, whitish, joined at the base, inserted into the receptacle; they are alternately free, and fastened below by a broader base to the inner petals. Anthers from incumbent upright; on the loose filaments barren; on the three others whitish with yellow pollen, linear, blunt at each end, emarginate, a little curved inwards, convex at the back, plano-concave in front, twin-furrowed. Germ fleshy, pyramidal-cylindric, blunt, crimson, smooth, with three calluses at the tip, on a short peduncle, ending in several small, blunt teeth pressed close to it. Style very thick, somewhat flattened, with two of the angles nearer to each other, a little attenuated at the base, pubescent, red, shorter than the germ. Stigma blunt, yellowish red, pubescent at the edge. Capsule oval, smooth, transversely nerved, compressed, with two rims along the back. Seeds orbiculate.

[Mr. Miller, by mistake, made this a native of Canada, whereas all the species come from the Cape of Good Hope.

It is scarcely to be distinguished from *minor* but by its more robust sta-

ture and upright growth, as also perhaps by a bulb more apt to produce numerous offsets, and somewhat smaller in proportion to the plant than that of *minor*; it flowers in May, and was introduced about 1767, by Mr. William Malcolm.]

It requires the protection of a greenhouse, and is easily cultivated, occasionally increasing itself by offsets. The soil in which it thrives is sandy loam; and when the leaves decay it may be kept two or three months without water.

3. ALBUCA MINOR (small albuca). Bot. Mag. 720. *Inner sepals, glandular at end, inflexed; scape erect; flower nodding; leaves, linear, subulate, channelled, smooth.*—It has a round flattish bulb, from which arise two or three rush-like channelled leaves, a foot in length, and half an inch in breadth, and in July the flowers are produced: these grow on stems about a foot high, having five or six greenish yellow flowers growing almost in form of an umbel at the top: in England, these are rarely succeeded by seeds. After flowering, the leaves decay, and towards the end of winter spring up again. The scape is six inches high, and scarcely a line in diameter. Racemes seven inches in length. Peduncles an inch and a half long. Bractes green, with clear white edges; they are half an inch long and quickly wither. Flowers yellow. Style obversely pyramidal, the length of the germ covered with glandulous scales. It generally flowers twice a-year, the first time in March or April, and again in July or August. Found by Thunberg, at the Cape, growing in company with *A. major*, in sandy wastes, near Sandanha Bay. Introduced, 1768.

If the roots of this sort are kept in pots, filled with light earth, and are sheltered under a hot-bed frame in winter, they will thrive, and produce flowers. It may be increased by offsets, which occasionally grow out of the bulb, and requires the greenhouse throughout the year, observing to give it little or no water during the season in which it is in a dormant state. The soil should be sandy peat.

[4. ALBUCA FLACCIDA (flaccid albuca). Jac. ic. 2. 144. *Inner sepals, glandular at end, inflexed; peduncles spreading at right angles; leaves lanceolate; linear obliquely bent.*—This species attains to

the height of more than two feet, and produces its yellowish white flowers in May and June. A native of the Cape of Good Hope. Introduced, 1791.

5. *ALBUCA VIRIDIFLORA* (green flowered albuca). Bot. Mag. 1656. *Inner sepals, glandular at end, inflexed; scape erect, wavy; flowers cernuous; leaves linear, subulate, channelled, outside hairy.*—Flowers in June and July. A native of the Cape of Good Hope. Introduced, 1794.

6. *ALBUCA COARCTATA* (channel leaved albuca). *Interior sepals vaulted at tip; leaves smooth.* In this species the leaves are linear, subulate, deeply channelled, two feet long and upwards, scarcely half an inch wide at base. Scape a little shorter than the leaves, not so thick as a goose quill. Raceme close, half a foot in length. Peduncles spreading, a little more than an inch long. Bractes almost the length of the peduncle. Flowers yellow. Outer petals oblong, thickened at the tip, above an inch in length; inner oval, a little shorter than the outer ones. Barren filaments somewhat shorter than the fertile ones, convex without, channelled within: anthers saggitate, effete. Style prism-shaped the length of the germ; terminated by a stigma from the angles of the style rounded at tip.

It flowers in May, and was introduced in 1774.

II. *Sis stamens fertile.*

7. *ALBUCA FASTIGIATA* (level topped albuca). Bot. rep. 450. *Interior sepals vaulted at tip; leaves linear, flattish, smooth; peduncles very long, spreading.*—The leaves are one foot and a half in breadth, first channelled, then flattish. Scape only half the length of the leaves, the thickness of a goose quill. Raceme fastigate, the length of the scape. Peduncles in flowering-time, spreading, afterwards upright, three or four inches in length. Bractes membranaceous, watery, white, rufescent on the back, half an inch long. Flowers white. Outer petals linear oblong, thickened at the tip, not an inch in length; inner oval, oblong a little shorter than the outer ones. All the filaments fertile, three alternately somewhat shorter, convex without, channelled within. Style prism-shaped, furrowed, a little longer than the germ, rather higher than the stamens, covered with very short scales, especially towards the

tip, green with yellow furrows, terminating in a stigma from the angles of the style, rounded at the tip.

It flowers in May, and was introduced in 1774.

8. *ALBUCA CAUDATA* (upright flower albuca). Jac. ic. 2. t. 442. *Inner sepals glandular at end inflexed; leaves linear lanceolate, convolute, upright, shorter than scape.*—A native of the Cape of Good Hope. Flowers in May. Introduced, 1791.

9. *ALBUCA AUREA* (golden albuca). *Inner sepals glandular at end, inflexed; leaves linear, lanceolate, flat; peduncles very long, erect, spreading; flower upright.*—The flower of this species is of a golden yellow. It grows to about two feet in height. A native of the Cape of Good Hope. Flowers in May and June. Introduced, 1818.

10. *ALBUCA FRAGRANS* (sweet-scented albuca). Jac. schœn. l. t. 81. *Inner sepals vaulted at end; leaves linear, lanceolate, channelled; peduncles spreading the length of nodding flower.*—The flowers of a yellow green, are produced in June and July. The plant is about a foot in height. A native of the Cape of Good Hope. Introduced, 1791.

11. *ALBUCA SETOSA* (bristly rooted albuca). Bot. Mag. 1481. *Inner sepals glandular at end, reflexed; leaves linear, lanceolate, flattish; peduncles at right angles; flowers erect.*—Leaves about a foot and a half long, and about half an inch over towards their bases, stem somewhat higher than these; pedicels straight, about the thickness of a crow quill; corolla rather more than an inch long, yellowish with a broad green stripe down the middle of each segment; germ green; style yellow, green at the angles; capsule brown, about the size of a filbert. This species flowers in May; the flowers possess a scent resembling that of bitter almonds, which, however, can only be perceived by smelling close to the bloom. Introduced by Mr. Masson in 1795, from the Cape of Good Hope.

12. *ALBUCA VITTATA* (ribbon albuca). Bot. Mag. 1329. *Scape shorter than leaves, few flowered; flowers nodding; filaments 2-toothed.*—The bulb of this species is about the size of a pigeon's egg; stem rather shorter than the leaves, which are about five or six inches long; flowers yellow; each petal-like segment intersected by a bright green

vertical stripe or fillet; and blooms in the latter end of summer. Native of the Cape of Good Hope, from whence it was introduced into this country by Mr. G. Hibbert, in 1802.

13. *ALBUCA PHYSODES* (dingy flower-ed albuca). Bot. Mag. t. 104. *Leaves lanceolate: raceme pyramidal before the leaves; filament glandular at base.*—The root of a pinkish hue, on the outside is sebtunicate, nearly solid, of a very close texture and firm substance, ovate-pyramidal. Leaves lanceolate oblong, appearing long after the entire decay of the inflorescence. Raceme oblong, pyramidal. Pedicels filiform, several times longer than the diameter of the corolla, horizontally patent, at right angles with the rachis. Filaments, about a third shorter than segments, equal, subulate, narrowed at their base, where they are slightly glandular-pubescent. Anthers oblong. Style upright, triquetral filiform, stigma a depressed point, glandularly pubescent. Germen pyramidal ovate streaked, sulcate. A native of the Cape of Good Hope. The flowers hexapetelously parted, are of a very pale yellow brown colour. They are produced in July and August. Introduced, 1804.

14. *ALBUCA EXUVIATA* (adder's skin albuca). Bot. Mag. 871. *Leaves linear, subulate, channelled; scape simple shorter than leaves; scales of root wrinkled across.*—The bulb growing above ground is covered with scariosse stiffish integuments, some of which are elongated into high roots; sheaths transversely waved or ridged; leaves few, fleshy, convex, channelled, narrow, attenuate; scape shorter than these, racemes patent, ovate, oblong; pedicels about the length of the corolla; bracteas sphacelate; corolla entirely patent, segments oval, oblong; stamens patent, subulate; style subclavately filiform obtusely triquetral, longer than both germen and stamens; stigma subcapitate, hairy; seeds according to Jacquin, black, several, membranously winged, flat, oblong, polished.

Jacquin applied the specific name of *exuviata*, from some resemblance in the membranous tunics of the bulb to the sloughs annually cast by snakes.

5. *ALBUCA ABYSSINIA* (Abyssinian albuca). *Inner sepals vaulted at end; leaves linear, channelled smooth.*—Leaves two or three feet high, an inch wide at

most, narrowing gradually towards the tip. Sharp, channelled, quite entire, marked with dusky lines on both sides, somewhat erect. Scape erect, round, the thickness of a reed, somewhat glaucous, from three to five feet in height, including the raceme. Peduncles one-flowered, short, scattered, supported by channelled, narrow, sharp, ascending, greenish bractes longer than the flower. Flowers drooping, without scent. Petals longitudinally greenish in the middle, whitish on the edges, yellow at the tip, flat on the back, concave at the end, and on the sides; the three outer narrower. Filaments linear, compressed, a little shorter than the petals, upright, whitish, at the base next the germ dilated and concave, above it, swelling out within into a green bump; they are all equal, and have large oblong, pale, yellow anthers. Germ pyramidal, three-sided sessile, smooth. Style filiform, three-sided at the base, round above, upright, yellowish, the length of the stamens. Stigma blunt, quite simple. Capsule ovate, three-sided, smooth, six-valved at the tip, upright. Seeds black, oblong, unequally, triangular, flat.

This species is a native of Abyssinia, and was introduced into this country in 1818.

16. *ALBUCA SPIRALIS* (spiral leaved albuca). *Inner sepals vaulted at end; leaves linear, subulate, convolute at the end spirally twisted.*—Root leaves few (4-6), linear, filiform, upright at bottom, then spiral, when the plant is more mature, flexuose, villose, scabrous, shorter than the scape. This is simple, filiform, flexuose, nodding at the top, streaked, villose, scabrous, of a finger's length, seldom a span long after flowering, one-flowered, seldom two-flowered. Bracte lanceolate, acuminate, shorter than the peduncle. Three filaments without anthers.

A native of the Cape of Good Hope. Introduced, 1705.

17. *ALBUCA VISCOSA* (viscose albuca). *Inner sepals vaulted at tip; leaves hairy, glandulose.*—Root leaves very many, linear narrowing gradually to the tip, where they are acuminate, very fine glandulose, viscid, upright, scarcely half a line wide, not half so long as the scape. This is simple, streaked, villose, scabious, flexuose, erect, a foot high. Flowers in racemes, several,

somewhat drooping. Bracte at the base of the peduncle, lanceolate, acuminate, concave membranous on the edge. Peduncles very glandulose, drooping, longer than the bracte. Anthers fertile. It flowers in May and June; and was introduced (from the Cape, of which it is a native) about 1779, by John Fothergill, M. D.

Sweet observes, this genus "consists of several species, which thrive very well in a light sandy loam, mixed with decayed leaves or light vegetable mould. They are increased by suckers from the old bulbs; or leaves taken off with a scale from the bulk, will produce young plants."

ALBURNUM, the white soft substance that lies between the inner bark and the wood of trees, composed of layers of the former, which have not attained the solidity of the latter. In this state dealers in timber call it the sap. From its colour and comparative softness, it has been styled by some writers the fat of trees, *adeps arborum*.

The *alburnum* is found in largest quantities in trees that are vigorous; though in such as languish, or are sickly, there is a great number of beds. In an oak six inches in diameter this substance is nearly equal in bulk to the wood. In a trunk, one and a half feet diameter, as one to four and a half, &c. but these proportions vary according to the health and constitution of the trees.

This *alburnum*, according to the observation of Mr. Knight, appears to be generated by the action of the cortical vessels, and performs important functions in the vegetable economy. The experiments of Duhamel generally confirm this opinion. Different kinds of wood exhibit considerable variety as to hardness, as well as to thickness; in many trees indeed one side of the layers is so much broader than the other, that the medulla or pith is not placed in the common centre of the root. The tenacity of the wood is owing to innumerable vessels, which pass from one part to another: in general they have a longitudinal direction. These vessels perform several functions. The cellular substance binds the whole firmly together. The colour of the wood differs very considerably in different plants: this we have strikingly illustrated in two obvious examples, the oak and the

ebony; in the former of these it is brown, in the latter black.

It is the general opinion that each of these concentric layers is the production of one year; and this opinion derived much weight from the authority of Linnæus. It is supposed that the hard exterior layer is formed by the cold of winter; so far, indeed, has this opinion been carried as to produce assertions, that the date of particularly severe winters may be ascertained by the particular hardness of the layers formed during them: some have gone still farther, and add that the northern side of a tree may be known by the same means. Duhamel, Mirbel, and Gerardin contend against this doctrine. The former states that a tree will sometimes not form a single layer for a whole year, whilst at other times it will form a very considerable number. Dr. Smith does not consider the facts adduced by the French physiologists sufficiently strong to subvert the whole of the ancient opinion, and he adduces the uniform appearance of the wood of tropical trees, and of evergreens in support of it. At the same time he readily admits, that Duhamel has most completely exploded the belief of the influence of a northern aspect already mentioned. The occasional deviations from an uniform thickness may be accounted for by supposing the organs of the thickest side to be more perfect than the others. This is probably the cause; but it must be admitted to be a mere hypothesis.

The manner in which this substance is formed has long been a fertile source of contention amongst physiologists. Grew and Malpighi supposed it to be formed from the bark, and Dr. Smith adopts this opinion. Hales supposed that a new external layer was annually formed by the wood itself. Linnæus taught that the pith secreted annually a new internal layer. Mirbel has given some amusing observations on it. Duhamel ascertained, by making an incision into the bark of a tree, and by introducing pieces of tin-foil beneath it, that after some years the new wood was exterior to the tin-foil. Dr. Smith has seen the original specimens in the museum at Paris.

Dr. Smith records another experiment made by Dr. John Hope, the late professor of botany in the University of Edinburgh, which decidedly supports

those of Duhamel. We shall give the account in Dr. Smith's own words: "The bark of a willow tree three or four years old was carefully cut through longitudinally on one side for the length of several inches, so that it might be slipped aside from the wood in the form of a hollow cylinder, the two ends being undisturbed. The edges of the bark were then united as carefully as possible, the wood covered up from the air, and the whole bound up to secure it from external injury. After a few years the branch was cut through transversely. The cylinder of bark was found lined with layers of new wood, whose number added to those in the wood from which it had been stripped, made up the number of rings in the branch above and below the experiment."

The result of all the experiments made by Duhamel confirm the facts stated. The exception which he gives of the bark being produced by the wood is solitary, and in some respects objectionable. The following is the experiment alluded to: on taking off the bark of a cherry stock he observed a number of small gelatinous points on the surface of the wood, which were followed by a new bark and by a layer of new wood; whence Mirbel concludes that the latter is actually derived from the *alburnum* and wood, which first produces the *ambium* of Duhamel, or the gelatinous matter already noticed; so that there is a regular circle of operations, the first of which it is not easy to determine. Perhaps the safest conclusion that can be deduced will be, that under certain circumstances, the nature of which is completely concealed from us, the wood does form bark. It still remains to be decided, whether or not this is the ordinary process of nature: we confess that it does not appear to us to be so.

The *alburnum* is frequently gnawed in pieces by insects, which lodge in the substance, and are nourished from it.

ALCEA (from Ἀλκή, robur; on account of its supposed medicinal strength in curing the dysentery, &c., for which it was formerly held in great repute). *Malva*. Tournef.

Class 16, 7. Monadelphia Polyanthra. Nat. Ord. *Columnifera Malvaceæ*, Juss.

The characters are—that the calyx is double, each one-leaved; the outer cut

half-way into six parts, permanent and very spreading; the inner cut half-way into five parts, larger and permanent; the corolla consists of five, obcordate, emarginate, spreading petals, coalescing at their bases; the stamina are filaments uniting into a sort of five-angled cylinder at bottom, loose at top, and inserted into the corolla; the anthers almost kidney-shaped; the pistillum has a germ orbiculate, style cylindric, short, stigmas about twenty, setaceous, of the length of the style; the pericarpium is composed of many jointed arils, in a ring round a columnar flattened receptacle, parting and opening on the inside; the seed is one, flat, kidney shaped in each aril. —Schreber and Jussieu join this genus to *Althæa*.

1. ALCEA ROSEA (common hollyhock). Cav. Dis. 2 t. 28, f. 1. Stem upright, hairy; leaves cordate 5-7 angled; crenate rugose; flowers axillary sessile.—The cultivation of this magnificent eastern plant is of great antiquity in this country. Its noble size, majestic height, and splendid flowers, could not fail to attract the attention of our earliest collectors of exotic plants; and although we cannot state the time when the hollyhock was first brought to this country, it was certainly much earlier than the date mentioned in the *Hortus Kewensis*, or any other modern work on plants that we have been able to consult. Dr. Turner speaks of it as a familiar plant in his work, dated 24th of June, 1564; and Gerard, in 1597, observes, that it was then sown in gardens almost everywhere.

The derivation of the English name of this flower may be traced to the Saxon language, the old name of holly-oak being the same as holihec. Mortimer retains the old name of holyocks for these plants in his work on husbandry, as late as the year 1707, wherein he says, "Holyocks far exceed poppies for their durableness, and are very ornamental." Turner spells it holyhock, and Gerard, and after him, Parkinson, calls it holihihock.

The French, who consider this plant as a native of Syria, call it by several different names, as, *rose trémière*, *rose d'outre mer*, *rose de mer*, *rose de Damas*.

In floral language, the hollyhock is figured as the symbol of fecundity, and its extreme fruitfulness seems to justify the device.

These plants grow naturally in various eastern parts of the globe. It is common in China, from whence the seeds of the tall as well as the dwarf hollyhock have been frequently received. Pliny speaks of this flower in the fourth chapter of his twenty-first book, where he describes it as a rose growing on stalks, like mallow. A late traveller in Africa says, the hollyhock is also a native of the Marootzee country, where he found it growing wild among the rocks around Kurreechane; but these appear to have been only of a yellow colour.

We have but few flowers that contribute more to the embellishment of large gardens than the hollyhock, although the hardy nature of hollyhocks, and their easy propagation, have rendered them so common that they are much less regarded by the generality of florists than they deserve, since this yields to no flower for the grandeur and beauty of its appearance, as well as the great variety of its colours, which embraces all the shades of the rose, from the palest blush to the deepest carmine, and from a pure white; the yellows are equally numerous until they reach to the richest orange, from which the colour is carried on to a dark chestnut. Others are dyed of a pale reddish purple running up to a black.

The tall hollyhock is not adapted for the small parterre, its aspiring height befits it for a nobler situation, and it rises with a degree of dignity from amongst clumps of flowering shrubs that is not excelled by any plant whatever. But to give full effect to this flower they should be planted in clumps of from five to ten plants according to the size of the grounds, and each of these clumps should be formed of one colour, contriving to have a clump of the darkest coloured flowers between two plantations of the paler colours.

Where the grounds are very extensive, clumps of mixed varieties may be admitted, but these never tell so well in the perspective as a mass of a single colour. It considerably adds to the beauty of those plants when they are so placed as to appear emerging from among dwarf shrubs, where the lower part of the stalks are obscured. They must not be planted too near each other, as every stem of flowers should be seen distinct, and when they require support,

they should each have a separate stake, for when several are pressed together, the flowers have not room to display their beauty, and they take a stiff and unnatural appearance instead of that careless freedom which constitutes the beauty of all plants.

"Yet in this wild disorder, art presides.
Designs, corrects, and regulates the whole.
Herself the while unseen."

The hollyhock may be planted so as to ornament the bounds of gardens, by forming clumps at the angles and at irregular distances near the fence, so that they do not form a straight line, for such an arrangement would only make the limits of the ground more conspicuous. For small gardens, or where the situation is much exposed to the winds, the dwarf hollyhock is the most desirable, and when some of these are planted in front of the taller kind, it adds considerably to the beauty of the group. When the children of the lower classes of society are become more civilized, and their parents sufficiently enlightened to instruct them in their duty, so that their amusement may not consist in idly destroying what cannot benefit them, but materially injures their more polished neighbours, the hollyhock will be planted in the hedges of our fields, and the whole appearance of the country be much improved by relieving the uniformity of the generality of fences, and considerably benefit would at the same time be received by those cottagers who have the prudence to give attention to the hive, since the late season at which the hollyhock flowers, gives the bee a second season for collecting its sweets; and when a wet or cold summer has impoverished the hive, or brought sickness into the swarming community, these autumnal flowers will afford it relief, and give the bees strength to endure the winter, which is also considerably shortened to them by the aid these flowers give, to enable them to subsist without falling on their store, at too early a season. The hollyhock is also likely to hold a higher rank in rural economy than that of feeding bees. For some years past it has been known that a good strong cloth may be made from the fibrous bark of the flower-stalks of this plant; and in the year 1821, about 280 acres of land, near Flint, in Wales, were planted with the

common hollyhock, with the view of converting the fibres of this plant into threads similar to that of hemp or flax. In the process of manufacture it was discovered that the plant yields a fine blue dye, equal in beauty and permanence to the best indigo; this important discovery cannot fail of rendering beneficial consequences, both in a commercial and agricultural point of view.

2. *ALCEA SINENSIS* (China hollyhock). Cav. diss. 2. t. 29. f. 3. under *Althæa*. *Stem straight and smooth below ramose. Leaves cordate, rough, crenate, angular.* A native of China, differing from *A. rosea* in the plant being annual, dwarfer, and the flower a little larger. The flowers are rose coloured. Flowers in July. Introduced 1818.

[3. *ALCEA PALLIDA* (pale flowered hollyhock). *Stem erect, hispid; leaves roundish, cordate; petals two-lobed.* A plant four to six feet in height, with whitish-purple flowers, flowering in July and August. A native of Hungary. Introduced 1805.

4. *ALCEA FLEXUOSA* (flexuous-stemmed or Seringapatam hollyhock). Bot. mag. t. 892, under *Althæa*. *Stem somewhat flexuous, hispid; flowers axillary, solitary; leaves cordate, somewhat 7-lobed, obtuse, on long foot stalks.* This species was raised from seeds sent by Lady Gwillim from Madras, under the name of Seringapatam Hollyhock. The flowers of all that have hitherto been raised, have proved single, and of a scarlet colour; the stem is about two feet high, somewhat zig-zag from leaf to leaf, beset with rigid patent hairs, the petioles long and hairy, the leaves, 3, 5, and, 7-lobed, crenate, villous; inner calyx frequently six-cleft as well as the outer; capsules hispid. A native of the East Indies; flowering from June to August. Introduced 1803.

5. *ALCEA ACAULIS* (stemless hollyhock). Cav. diss. 2. t. 27. f. 3. *Stem thick and very short; leaves cordate, rotundo-lobate; flowers spicate pedicels one-flowered, shorter than the petiole; petals bearded at the base.* This species is about six inches in height, with pale yellow flowers. A native of Syria. Flowers in June and July. Introduced 1680.

6. *ALCEA COROMANDELIANA* (coromandel hollyhock). *Stem erect; leaves sub-triangular crenated, obtuse, five-nerved 3-lobed; flowers solitary*—Grows

from two to three feet in height; flowers flesh-coloured. A native of Pondicherry, East Indies.]

7. *ALCEA FICIFOLIA* (fig-leaved hollyhock). Cav. diss. 2. p. 92 t. 28. f. 2. *Stem erect pilose; leaves palmate, lobes oblong, obtuse, irregularly toothed.* A distinct species from the *rosea*; the difference in the form of their leaves always continuing. The leaves of the *rosea* are roundish and cut at their extremity into angles; whereas those of the *ficifolia* are deeply cut into six or seven segments, so as to resemble a hand. (Both these sorts were cultivated by Gerard, in 1597). The flowers are large, single or double; generally yellow or orange coloured, in terminal spikes. It attains to the height of six feet. Flowering from June to August.

[8. *ALCEA LEUCANTHA* (white-flowered hollyhock). Lindl. in hort. trans. 7. p. 251. under *Althæa nudiflora*. *Leaves roundish, cordate, five-angled or three-lobed crenate, roughly pilose; stem petioles, and peduncles hispid; flowers twin white; petals cuneate emarginate.* A biennial, with a stem four feet high, and the habit of the common hollyhock.

This plant is remarkable for its hispidity, which is caused by an infinite number of fascicled stiff brittle hairs, and for the want of leaves or bractæ under the flowers. It differs from *A. pallida* in these particulars and in its leaves not being soft but extremely harsh to the touch. Flowers abundantly in July and August.

Raised from seeds from the Altai mountains, presented to the H. S. by Dr. Fischer, in 1824. It is quite hardy.

2. *ALCEA CARIBBÆA* (Caribbean or West Indian hollyhock). Bot. Mag. t. 1916. *Stem straight, hispid; leaves roundish, lobed, crenate, serrated; flowers solitary, almost sessile; petals with bearded claws, stigmas diffuse.* In many respects this plant much resembles the *A. rosea*, but seems to differ besides in diminished stature; in the more uniform rounded lobes of the leaf more neatly sawed at the edge; in the flowers being always solitary, which, in the latter, grows mostly two or more from the same axil; in the bearded claws of the petals; and, perhaps, in the four-cleft palmate stipules. The flowers are rose-coloured, with a yellow base. It flowers in March, and April; and is generally about three feet in height.

Introduced. 1816. It requires to be kept in the stove, and seems remarkably impatient of cold. Propagated by seeds.

10. *ALCEA AFRICANA* (African hollyhock). Lour. fl. coch. p. 421. *Stem shrubby, hispid; leaves three-lobed, crenated; flowers solitary, axillary, stalked.* A shrub four feet high, with scarlet flowers; a native of the Eastern coast of Africa.]

The species of this genus are propagated by seeds, which, as has been already observed, should be carefully saved from those plants whose flowers are of the best colours. If these are preserved in their covers until spring, the seeds will be better, provided they are gathered very dry, and care be taken that no damp comes to them in winter, which will cause their covers to be mouldy and thereby spoil the seeds.

The seeds should be sown on a bed of light earth, about the middle of April, and must be covered about half an inch deep: some persons sow them in shallow drills, and others scatter the seeds thinly over the whole bed. When they are sown in the former method, the plants generally come up thick, and will require to be transplanted sooner than those which are sown in the latter. By the first, the seeds may be more equally covered, and kept clean with less trouble, because the ground between the drills may be hoed. When the plants have put out six or eight leaves, they should be transplanted into nursery-beds, at a foot distance from each other, observing to water them until they have taken good root; after which they will require no farther care, but to keep them clean from weeds till October, when they should be transplanted where they are to remain.

Some persons let their plants remain a year longer in the nursery-beds to see their flowers, before they remove them to the flower-garden; but when this is intended, the plants should be planted at a greater distance in the nursery-beds, otherwise they will not have room to grow. However, I have always chosen to remove my plants the first autumn, for young plants more surely grow, than those which are older; and if the seeds are carefully saved, there will not be one in ten of the plants come of bad colours. The stove species are propagated in the same manner as the hardy species.

ALCHEMILLA, (named as Linnaeus asserts, from its supposed alchymical purposes; but, as others maintain, from its Arabic appellation *Alkemelyeh*.)

Class 4, 1. Tetrandria Monogynia.

Nat. ord. *Senticosæ Rosaceæ* Juss *Sanguisorbææ*, LIND.

The characters are: *Calyx 8-leaf, the alternate segments smallest, style from the base of the ovary. Seed 1 naked, covered with the calyx.*

1. *ALCHEMILLA VULGARIS* (common lady's mantle). Eng. Bot. 597, *Leaves reniform, plaited, serrated, stem and petiole smoothish, flowers dichotomous corymbose.*

It grows naturally in high pastures in several parts of England, but it is not very common near London: the roots are composed of many thick fibres, which spread greatly when they are in a proper soil; the leaves rise immediately from the root sustained by long petioles; they are roundish, and divided into seven or eight lobes, scalloped round the edges, somewhat like the ladies scalloped Mantles, from whence it had its name. The flower-stems arise between the leaves about a foot high, which divide into many branches, and have at each joint one small leaf, shaped like those below; the flowers are composed of an herbaceous calyx, without any corolla, so that the only beauty of this plant is in the leaves, which are used in medicine, and are esteemed to be vulnerary, drying and binding, and are of great force to stop inward bleeding.

[The whole plant is astringent. In the province of Smolandia in Gothland, they make a tincture of the leaves, and give it in spasmodic or convulsive diseases. In an epidemic complaint of this kind, which occurred in 1754, it was found of great use. Before this period, the infusions, tincture, and extract of it had been found effectual in milder cases of a similar kind. The root is more austere than the herb, and the virtues are communicated alike, to water and spirits of wine.

Horses, sheep, and goats eat it. Cows are said not to be fond of it; yet Haller informs us that the astonishing richness of the milk in the famous dairies of the Alps, described by Scheuchzer, is attributed altogether to the plenty of this plant, and that of the ribwort.

The variety β , is much smaller, the

leaves are much whiter, and appear silky; the flower stems do not branch out so much, nor are the flowers produced in so large clusters; their calyx is broader, and the segments more obtuse. (Besides this, the species varies much in size, being abundantly larger in a moist soil, and in gardens, than on its native dry hills and mountains. Dr. Withering mentions another variety with a white calyx.)

"Of all our natives," says Mr. Abbot, with an amiable degree of enthusiasm, "this is the most elegant plant." Various circumstances often combine to attach a botanist to some particular favourite and give it for him almost an exclusive charm. Haller was enamoured with *Abrantia Major*; Linnaeus with *Trientalis europæa* and *Melanspyrum nemorosum*; and Sir I. E. Smith, of Geum rivale.

2. *ALCHEMILLA CAPENSIS* (cape lady's mantle). *Leaves reniform, somewhat lobed, repandly crenated, hairy.* We are informed by Thunberg, that this species is a native of the Cape of Good Hope, on the sides of hills and mountains, where it is about six inches high.

3. *ALCHEMILLA PUBESCENS* (pubescent lady's mantle). Horb. ber 2. t. 79. *Leaves reniform, 7-lobed toothed, silky beneath, corymbs terminal.* A native among rocks on the higher caucasus. It flowers in June or July, and was introduced in 1813.

4. *ALCHEMILLA MONTANA* (mountain lady's mantle). Mill. ic. t. 18. *Leaves reniform 9-lobed beneath, with the stem and petioles silky. Flowers fastigate, clustered sessile.* Native of Europe, found in mountain pastures; flowering in June and July. It has also been met with in Scotland, on the Seedlaw hills, Angus-shire.

5. *ALCHEMILLA ALPINA* (alpine lady's mantle). Eng. bot. t. 244. *Leaves digitate; leaflets 5-7 lanceolate; cuneated obtuse, serrated at the apex, with the serratures adpressed, clothed with white satiny down beneath.* Most rocky mountains in the Alpine parts of England and Scotland produce this elegant little plant; and in proportion to the barrenness and openness of its situation, is the rich silvery satin of the back of its leaves more dense and splendid. It is most conspicuous when agitated by the wind; for the flower, though they

partake externally of the same silvery hue, are small and inconsiderable.

The satiny under side of the leaves of this and the following species has given rise to the generic English name of Lady's Mantle.

It is also a native of Sweden, Denmark, the Alps, and other cold parts of Europe, upon moist boggy places; and is admitted into gardens for the sake of its elegance. It is perennial, and flowers in July.

6. *ALCHEMILLA SERICEA* (silky lady's mantle). *Leaves digitate in sevens lanceolate acute from the middle to the end, deeply serrated; silky beneath.* This species is a native of the Caucasus, and is much larger in every part than *A. Alpina*. It flowers in June and July; introduced 1813.

7. *ALCHEMILLA PENTAPHYLLA* (five-leafletted lady's mantle). Bocc. Mus. 1. t. 1. *Leaves three together; leaflets ciliated, multifid; smooth stems.* Grows naturally on the high Alps, as Gothard, Furca, Speluga, Pilat, &c. and is only to be found in some few curious botanic gardens in this country. Cultivated by Mr. Miller, 1748.

8. *ALCHEMILLA NIVALIS* (snow lady's mantle). *Leaves stem clasping; sheathing, multifid; clothed with silky hairs on the outside.* A tufted plant, native of the province of Popagan, on the snowy top of mount Paramo de Puraca.

9. *ALCHEMILLA SIBBALDIAFOLIA* (sibbaldia-leaved lady's mantle). Kunth nov. gen. amer. 6. p. 226. t. 561. *Leaves deeply 3-parted; clothed with adpressed pubescence beneath; segments deeply serrated, lateral ones bifid; flowers conglomerate, diandrous and usually digynous.* A plant six inches high, native between Mexico and Iolucco, near Tianguillo, and on mount Orizba; flowering in July. Introduced 1823.

10. *ALCHEMILLA RUPESTRIS* (rock lady's mantle). Kunth nov. gen. amer. 6. p. 224. *Leaves profoundly 3-parted; clothed with silky pili beneath; segments deeply serrated; flowers somewhat corymbose, diandrous, and trigynous; stipules entire.* A creeping plant found on the burning mountain Rucapichincha, near Quito, S. America.

11. *ALCHEMILLA TRIPARTITA* (tripartite-leaved lady's mantle). Ruiz et Pavonil. per. 1. p. 68. *Hairy, stem creeping filiform; dichotomously branched, leafy above; leaves deeply 3-parted;*

segments cuneiform, 3-5 cleft; stipulas unequally bifid. A plant three inches high, native of Peru, on the cold tops of mountains; in spring.

12. *ALCHEMILLA APHANOIDES* (aphanes-like lady's mantle). *Leaves many-parted; stem erect.* This is a small plant, about the size of Parsley Piert, or *A. arvensis*, and much resembling it in the leaves; it is also annual like that; but has the eight-cleft calyx of this genus. The stems are a little branched, round, and pubescent. The root-leaves petiolate, the others stem-clasping. Racemes terminating, subverticillate. Found in New Granada, by Mutis.

13. *ALCHEMILLA PECTINATA* (Pectinate-leaved lady's mantle). Kunth n. g. amcr. 6, p. 226. *Leaves roundish-nerved, 9-11 lobed pectinately serrated, clothed with silvery silky down beneath; radical leaves many lobed, on long petioles stipules, 3-5-cleft; flowers 8-10-cleft; diandrous usually pentagynous.* A plant three inches high, native of Mexico, near Salapas San Andres, and Cruz Blanca.

14. *ALCHEMILLA PINNATA* (Pinnate-leaved lady's mantle). Ruiz et Pavon. fl. per. 1. p. 69. *Leaves pinnate, leaflets bifid or trifid; stems branched, sarmentose creeping; flowers diandrous digynous.* A native of Peru, on the high cold humid mountains of Tarnea and Panathuara.

15. *ALCHEMILLA ARVENSIS* (corn parsley piert). Scop. carn. 1. p. 115. Eng. bot. 1011. *Stems many, slender, leafy, four inches long, round; leaves roundish, three-parted, deeply lacinate, the lower ones petiolate the upper ones sessile, hoary beneath; flowers herbaceous, axillary; calyx cut into eight segments.* It varies with one pistil and seed, and, as some botanists say, it is always so. According to Gærtner, it has only one seed in the gardens usually, in the wild plant constantly. Very frequently in fallow fields, gardens, and on heathy banks, where the soil is gravelly or sandy, springing up in autumn or during mild weather in the course of the winter or early months, and flowering all the summer.

Parsley-piert is a strange corruption from the French *percepierre*, which name it acquired from its supposed lithontriptic qualities.

These species may be propagated by parting their roots, for which the

best time is autumn, that their roots may be established before the drying winds of the spring come on. They should have a moist soil, and a shady situation. When they are propagated by seeds, they should be sown in autumn, on a shady moist border, and when the plants come up, they will require no other care but to be kept clean from weeds.

[Those species that are native of South America, should be grown in small pots, well drained with shreds, and filled with a mixture of loam and peat, and placed among other alpine plants.

ALCHORNEA (so named after Mr. Stainsby Alchorne, apothecary of London).

Class 22, 13, Dioecia Monadelphia, Monadelphia Octandria, Swartz.

The characters are *MALE, Calyx, Perianth, three or five-leaved; leaflets ovate, concave, equal, coloured, deciduous; corolla, none; stamens, filaments eight, equal, scarce longer than the calyx, slightly connate at the base. Anthers ovate, upright; pistillum, a rudiment. FEMALE, Calyx, perianth one-leaved, four or five-toothed, teeth equal, small; corolla, none; pistillum, germ twin, superior; styles two, very long, filiform; stigmas simple, acute; pericarpium, capsule berried, two-seeded, two-celled, two-valved; seeds solitary, large, oblong.*

ALCHORNEA LATIFOLIA (Swartz: prodr. 98). *MALE, Calyx, three-five-leaved; corolla, none; FEMALE, calyx, five-toothed; corolla, none; style, two-parted; capsule berried, dicocous.* A shrub native of Jamaica.

ALDROVANDA (named by Monti, in honour of Ulysses Aldrovandus, a great traveller and collector; once prefect of the botanic garden at Bologna).

Class 5, 5. Pentandria Pentagynia. Nat. Ord. *Droseraceae*.

The characters are *Sepals and petals, 5, not appendiculate. Stamens 5, styles 5, filiform, very short, stigmas obtuse. Capsules globose, five-valved, one-celled, ten-seeded.*

ALDROVANDA VESICULOSA (Bladdery Aldrovanda), Lam. Ill. t. 220. *Root perennial, stems slender, herbaceous, almost simple. Leaves small, 6-9 in a whorl, approximate, wedge-shaped, bearing 5 or 6 threads, each terminated by a bladder. Flowers solitary, calyx green, deeply five-cleft, with ovate,*

concave leaflets. Petals ovate, dirty white, scarcely larger than the calyx, growing between the leaflets of it, and converging; stamens between the petals. Anthers yellow, twin; fruit globose, the size of a pea. A water plant found in marshes both in Italy and India, with whorled leaves, bearing bladders at the tip, almost in the same manner as *Utricularia*, but in tufts.

This plant requires to be grown in a marshy situation, or in water in a peat soil; when grown in water it should never be above 5 or 6 inches under its surface. It will also thrive well if planted in pots half filled with some species of sphagnum, and set in pans of water.

ALE, (*eale*, Sax.) a popular fermented drink, made from malt and hops; and chiefly distinguished from beer, another potable liquor made from the same ingredients, by the quantity of hops used therein; which is greater in beer, and therefore renders the liquor more bitter, and fitter for keeping.

The art of making an infusion of corn, and particularly of barley, similar to our ale, seems to have been known and practised in very ancient times among those people who lived in climates that did not afford grapes. It seems to have passed from Egypt into those western nations, which were settled by the colonies that migrated from the east. The *zythum* and *curmi*, mentioned by Tacitus, as the beverage of the ancient Germans, are supposed by Matthiolus to correspond to our ale and beer. Diodorus Siculus says, (lib. iv. c. 26. tom. i. p. 350.) that the Gauls, who lived in a country that produced neither grapes nor olives, made a strong liquor of barley, which they called *Zythus*. The natives of Spain, the inhabitants of France, and the aborigines of Britain, used this liquor, under the different appellations of *cælia* and *ceria* in the first country, of *cerevisia* in the second, and of *curmi* in the last; all which names literally denote the *strong water*.

After the introduction of agriculture into this island, ale or beer was substituted for mead, and became the most general drink of all the British nations which practised that art, as it had been of all the Celtic people on the continent. "All the several nations, (says Pliny, H. N. xiv. 29. tom. i. p. 729.) who inhabit the west of Europe, have

a liquor with which they intoxicate themselves, made with corn and water, *fruge madida*. The manner of making this liquor is somewhat different in Gaul, Spain and other countries, and it is called by many various names; but its nature and properties are every where the same. The people of Spain, in particular, brew this liquor so well, that it will keep good for a long time. So exquisite is the ingenuity of mankind in gratifying their vicious appetites, that they have thus invented a method to make water itself intoxicate."

The manner in which the ancient Britons and other Celtic nations made their ale, is thus described by Isidorus, (Orig. lib. xx. c. 2.) and Orosius, (lib. iv. p. 259.), cited by Henry (Hist. of England, vol. ii. p. 364, 8vo.); "the grain is steeped in water, and made to germinate, by which its spirits are excited and set at liberty; it is then dried and ground; after which it is infused in a certain quantity of water, which, being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor."

This ale was most commonly made of barley, but sometimes of wheat, oats, and millet. (Geopon. lib. vii. c. 34. p. 203.) This liquor is of such antiquity in England, that we find mention of it in the laws of Ina, king of Wessex. Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their ancestors, the Germans. (Tacitus, de Mor. Germ. c. 23.) Before their conversion to Christianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which those heroes enjoyed who were admitted into the hall of Odin. Amongst the liquors provided for a royal banquet, in the reign of Edward the Confessor, ale is particularly specified.

In Scotland and Wales they had two kinds of ale, called common ale and spiced ale; and their value was thus ascertained by law: "If a farmer hath no mead, he shall pay two casks of spiced ale, or four casks of common ale, for one cask of mead." By this law, a cask of spiced ale, 9 palms long, and 18 palms in diameter, was valued at a sum of money equal in effect to 7*l.* 10*s.* of our present money; and a cask of common ale, of the same dimensions, at a sum equal to 3*l.* 15*s.* Hence it ap-

pears, that common ale was at that period an article of luxury among the Welsh, and that it could only be obtained by the great and opulent. Wine at this time seems to have been unknown even to the kings of Wales, as it is not mentioned in their laws; though Giraldus Cambrensis, who flourished a century after the conquest, informs us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales. (Henry's Hist. vol. iv. p. 393.) By a statute of 35 Henry III., in 1272, mentioned by Hume (Hist. Eng. vol. ii. p. 224), a brewer was allowed to sell two gallons of ale for a penny in cities, and three or four gallons for the same price in the country. But the first assize of ale was fixed by the famous Stat. 51 Henry II.

The duties on ale and beer make a considerable branch of the revenue in England. They were first imposed in 1643, when the excise was first established; again by Car. II., and have been continued by several subsequent acts of parliament.

The saccharine matter extracted from the farinaceous seeds of which ales are made, and subjected to a fermentation analogous to that of wine, imparts to our ales a quantity of alcohol; and they have, therefore, in general, the cordial, exhilarating, intoxicating, and sedative qualities of wine. But their effect, in these respects, depends partly upon the quantity and condition of the saccharine matter that is employed, and partly upon the management of the fermentation to which they are subjected. Barley is chiefly employed for the purpose of making ales, though it might be prepared from any of the *cereal*ia; and this selection is very properly made, because its germination is most easily conducted, and under its germination it gives out its sugar most readily, and in greatest quantity. Ales, made in the ordinary manner, will be stronger or weaker according to the quantity of the saccharine matter that is used; and this will be greater or less according to the quantity of well-ripened farina in the barley that is employed, according to the mode in which it is malted, according to the proper and complete extraction of the saccharine matter by water, and according to the dissipation in a greater or less degree, of a quantity

of the superfluous water. The other qualities of ales, besides their strength or weakness, will depend upon the conduct of the fermentation. As the infusion of malt or wort is not so well disposed to fermentation as the juices of fruits, it will require the addition of a ferment; and afterwards the conduct of the fermentation will be very much the same with that of wines; at first very active, and then slowly protracted for a long time: but however ale is managed, its fermentation is not so capable of being rendered so complete and perfect as that of wine. In most ales there is probably a large portion of unassimilated farinaceous matter, which of course render ales more nourishing than wines, and they are, *ceteris paribus*, more liable to ascend in the stomach than wines.

The brewing of ale and beer of all kinds is conducted by the same general process: the difference between them arising solely in the first instance, from the different colour of the malt employed.

Good ale is commonly expected to be of a light amber colour, brisk, and sweetish, or at least not bitter to the taste; beer, in which we may include porter, is dark coloured, much less brisk, and having a bitter taste of a very peculiar nature. This last peculiarity in fact, seems to render porter at once more agreeable to the palate, and more nutritive to persons who take strong exercise; it also renders it capable of being longer and better kept.

Ale is a wine of grain, distinguished, however, by containing a larger portion of mucilage and saccharine matter, and by the absence of super-tartrate of potash, a salt found in all wines expressed from the grape. As distinct from porter, ale contains also its farinaceous matter and saccharine mucilage in a more undecomposed state, which gives that clammy consistency to the one, which we do not find in the other; and hence strong new ale becomes muddy by a mixture of alcohol, which effects no perceptible change in porter.

As produced by a common process, all malt liquor contains a common chemical alcohol or spirit. Professor Brande found in the best Burton ale, 8-88 per cent. of alcohol; in good home-brewed ale, 8-30; in three sam-

ples of Burton ale, 6-25; in Edinburgh ale, 6-70; in six samples of London ale, 5-82; in three of Scotch, 5-75; in Dorchester ale, 5-50. The best brown stout, or London porter, yielded only 6-80, according to this celebrated chemist.

A fermented liquor of the ale kind is commonly made in America, from Indian corn. In the interior of Africa, according to Mungo Park, from the seed of the *hollus spicatus* (which yielded beer, says this traveller, equal to the best and strongest of our malt liquor). We have seen wheat and oat malts, and they have been occasionally tried in considerable breweries. In some countries in the north of Europe, a mixture of rye and barley is said to be used; but the grain which is unquestionably best adapted for malting and brewing purposes is barley; (*hordeum vulgare*) and its Scottish variety big or bear (*hordeum hexasticton*), its germination being more easily effected, and its farinaceous matter more abundant, and more readily convertible into saccharine, than that of any other seed.

Good malt and hops are indispensable requisites in the making of any kind of malt liquor.

Of malt there are three different kinds, pale, brown, and amber, names derived from the colour, which depends upon the mode of drying the malt.

Pale malt differs but little in colour from barley, it being dried by a very gentle heat, just so far as to put a stop to the vegetation of the grain.

Amber-coloured malt is, in all its properties, intermediate between pale and brown, and is, and assumes this colour from having been dried by a greater heat than the pale malt.

Brown malt differs from both in having been exposed to a still greater temperature, so that the outside of the flower is in a measure charred. Pale, and amber-coloured malt not only affect the colour of the liquor brewed, but in consequence of the chemical operations of the heat upon the grain, during the process of malting, materially alter the quality of the beer, especially with regard to its properties of becoming fit for drinking, by growing fine.

The quality of malt differs according as it is more or less soaked, drained, germinated, dried, or baked, and the quality of the barley from which it is

obtained. High dried malt contains a less quantity of matter containing a vinous fluid, than the same quantity of pale malt. Hence the great breweries even for porter, prefer the pale malt of Hertfordshire, and use a patent burnt malt in small quantities, for colouring. In brewing porter for domestic use, burnt sugar and liquorice root boiled, in a small quantity of the liquor brewed, gives the whole quantity brewed a very good porter colour.

Hops, it is well known, are the seed or flower-pods of the *humulus lupulus*, or hop plant, which is cultivated in considerable quantities in the south of England, especially in Kent, Hampshire, and Surrey. The very best hops are grown at Farnham, in Surrey, and the borders of Hampshire. Hops are also grown in Worcestershire; but they have a sweet taste entirely different to that of the hops grown in Kent and Surrey. When the hops are ripe, they are picked by men, women, and children, and dried on a kiln, which is rather a curious process. They are then very closely packed, in bags or sacks, and sold to the public. The peculiar bitter taste of hops, and a weak aromatic odour, possessing sedative qualities to a considerable extent, are their recommendations for brewing. A pillow filled with hops, has often been found to induce sleep, when every thing else has failed. If they are filled with alcohol in a retort, there remains behind a solid green-coloured oil, of a sharp taste, and scarcely bitter, but reminding us of the peculiar flavour of good ale. This oil is the part of the hops which gives them their characteristic smell, and beer its distinguishing flavour. It is apt to be dissipated by long boiling. It does not appear according to the opinion of some brewers, that the intoxicating qualities of the ale are to be ascribed to the oil of the hop. The bitter principle of hops is easily extracted by water, and in no part of nature does it exist in greater perfection. "No re-agent," says Dr. Thompson, "is capable of throwing it down, except acetate of lead." This taste in all its peculiarities is communicated to the wort of beer and ale, and the stronger the liquor, the more of course it will bear of this valuable addition. In making good ale, a pound of hops is required to every bushel of malt.

The whole of this valuable domestic and public art may be comprised under an attentive observation of this five-fold process, viz. 1, Mashing; 2, Boiling; 3, Cooling; 4, Fermenting; 5, Cleansing.

I. OF MASHING. He grinds his malt, say fifty bushels, and uses a copper boiler, whose solid contents amount to 382 ale gallons, being rather more than 107,521 cubic inches, or, 62½ cubic feet. The boiler must be placed over brick work upon a furnace, and there must be conveniences for filling it with water, and for letting the water off, when sufficiently heated, into the mash tun.

The *mash tun* is a wooden vessel, comprised of staves properly fixed by means of iron hoops, and generally placed in the middle of the brewhouse. It usually has a false bottom, full of holes, at some little height above the true bottom, and to be capable of mashing fifty bushels of malt, must be at least one third larger than the bulk of the malt, or capable of containing seventy-five bushels. Into the boiler is to be put a quantity of water equal, at least in bulk, to that of the malt, and heated up to 190 or 180 deg., according to the judgment of the brewer, and the quality of the malt. But the best brewers employ the lower temperature. This water is then let into the mash-tun, and the malt, previously ground, to be let down into it immediately after. All the clots are now carefully broken, and mixed with the water by narrow wooden shovels. Great care must be taken to break all the clots, because the whole of the malt within them would otherwise escape the action of the water, and be lost to the brewer. When the malt and water are sufficiently mixed, the mash-tun is covered and left in this state about three hours. The wort is then allowed to run into a vessel prepared to receive it, known by the name of the underback. At the same time the cover is taken off the mash-tun, and more hot water put to the malt, the quantity always depending upon the strength and quality of the liquor to be brewed.

The *chemical* constitution of wort is in fact threefold. 1. Saccharine matter, which is perhaps the base or essential constituent. 2. Starch, which is instantly detected by dropping in a solution of iodine, that produces a blue precipitate. 3. Mucilage, which is pre-

cipitated in flakes; when the wort is poured into alcohol. This abounds more in the last drawn off wort than the first, and readily passes into the acetous fermentation: consequently the flavour of our malt liquor is improved, if we take only for the best ale, the wort that runs off first.

2. BOILING THE WORT is an important part of the art of brewing. It must be boiled for several hours, until it has acquired a sufficient strength, of which the brewer must judge, aided by the use of a saccharometer.

The hops are added while the wort is in the boiler, the quantity being proportioned to the strength of the wort, and the time the beer is designed to be kept. It is sometimes called *hopping* the wort. The hop coagulates the excess of mucilage and glutinous matter, which is extracted from the malt in mashing; for if this were suffered to remain in solution in the beer, it would never become fine, but would always be cloudy. The boiling hardens this substance in the same manner as the white of an egg acquires solidity by boiling. This coagulation is called the *breaking* or curdling of the wort. The boiling must therefore always continue until the breaking appears. Another object is attained by the hops in the operation of boiling, namely, the concentration of the wort. Its bulk becoming reduced by evaporation, which merely carries off a portion of water, the original quantity of fermentable matter remains concentrated in a smaller space.

3. The wort having been boiled down to the requisite strength, it is let down into the **COOLERS**, or shallow floors of wood, surrounded with a wooden ledge, and water-tight, placed in the most airy and exposed situation in the brewery; to hold the whole of the wort, at a depth not exceeding three or four inches. The wort should be cooled as speedily as possible, to the temperature of the atmosphere; because if it were allowed to remain long hot, it would probably become sour, and thus spoil the whole process. Considerable art is required in the construction, and in the so placing of these coolers, that a current of air may pass over them. When the wort is let out of the boiler into the cooler, the hops should be taken out, and pressed dry, as they retain a considerable quantity of wort.

4. After the wort is sufficiently cooled, it is let down into the *Fermenting Tuns*, or, as the brewers call them, the gyle-tuns, in order to be fermented; by which process it is converted from the luscious, sweet-tasted liquor, called wort, to the brisk intoxicating liquor which constitutes ale. The gyle-tuns are cylindrical wooden vessels, varying in size according to the extent of the brewery. The strength of the fermentation depends upon the quantity of yeast used. This is a frothy substance, of a brownish-grey colour, and bitter taste, formed on the surface of ale or wine when fermenting. If it be put into sacks, the moisture gradually drops out, and the yeast remains behind in a solid form, of the flavour and taste of cheese, but rather darker in its colour. Mr. Westrumb is the only chemist who has subjected yeast to analysis; and this so far back as the year 1796. He obtained from 15,360 parts of fresh beer,

of Potash	13
Carbonic Acid	15
Acetic Acid	10
Malic Acid	45
Lime	69
Alcohol	240
Extractive	120
Mucilage	240
Saccharine Matter	315
Gluten	480
Water	13,595
	<hr/>
	15,142
Loss	218
	<hr/>
	15,360

A gallon of yeast is generally allowed to about three barrels of wort: "one gallon to every sixteen barrels of ale or porter," says a London brewer. In about five or six hours after the yeast has been added, the fermentation begins. Its first appearance is a white line or border on the surface of the liquor, commencing at the sides of the tun, and gradually covering the surface of the liquor with a white scum. Fermentation is indeed the great secret of the brewers art, and the true theory of it has occupied the attention of chemists ever since the manufacture of ale began to be attended to by men of science. If the beer is meant to be full-bodied or hard, the fermentation must be conducted slowly, that is, so far as is con-

sistent with the richness of the wort; if it is intended to be brisk, the fermentation is stopped the earlier. If now the wort were allowed to remain in the gyle-tun, the yeast would again mix with it, and the consequence would first be a disagreeable bitter taste, known among brewers by the name of *yeast bitter*. The fermentation would proceed, though in a languid manner, and the ale would soon run into acidity. These accidents are prevented by drawing off the ale into small casks. This is called

5. CLEANSING. The casks are to be filled quite full, and left with their bungs open. The drawing off of the ale from the gyle-tun raises its temperature, and of course checks the fermentation. Sometimes therefore the cleansing is practised in summer, when the elevation of temperature in the wort is at its height. The ale continuing to ferment after it is put into casks, the yeast, as it comes to the surface, flows out at the bungs, and thus separates altogether from the beer. It is this separation that has induced brewers to distinguish it by the name of cleansing. In these casks, then, the yeast divides itself into two portions: the greater part rises up with the carbonic acid evolved, and flows out at the bung-hole; while another portion subsides to the bottom, and constitutes what is called the dregs of the beer. It is essential to the cleansing, that the casks should be always full, otherwise the yeast will not run off, and the beer will not become transparent. This object is accomplished in small breweries by a man constantly going round, and filling up the casks as they work down; but in large breweries by mechanical contrivances, according to the scale of their business. When the fermentation has subsided, the beer will in general be found transparent. It is then bunged up in the cask, and preserved for sale or use.

The *filling up* of the casks, if the beer works briskly, should be attended to every two or three hours at furthest, for the first fourteen or fifteen hours, after which the fermentation will in a great degree subside, and therefore less attention is required; but until 'he fermentation appears to have wholly ceased, yeast should be added according to the strength of the beer, the state of the weather, &c. This will generally be

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in about forty or sixty hours. Well-fermented beer, especially that designed for private use, generally becomes fine of itself; but the various changes of place, &c. that attend beer brewed for the public, have induced the general use of isinglass, as a *fining* or assistance of flacculent glutinous matter remaining in it. They are prepared, and will be seen to be perfectly innocuous. The pickings of book, or leaf isinglass, are thrown into a wooden tub, and when the tub is about one-third full, it is filled up with good stale small beer, which soon dissolves the isinglass. It is then rubbed through a sieve, and all the hard lumps picked out, the mass is reduced to a proper consistence for use, by the further addition of a quantity of good sharp beer. When used for fining, it must be well stirred, and in the course of a few hours the liquor may be drawn off, clear and bright; one pint is the usual proportion to a barrel of beer, but sometimes two, and even three, are necessary.

The age at which ale is drank, will depend upon a private person's stock, the size of his cellar, &c.; but more frequently upon his family habits, and the pecuniary means he chooses to devote to this beverage. Good mellow ale, soft and fine, may be had at a year old; and it is perhaps never better, than from one to two years old. Some persons never reckon ale to be old, unless it drinks a little hard, or with some approaches to sharpness or acidity; but this is a false taste: old ale in this sense, it has been said, is old ale spoiled.

If malt liquor, of any degree of strength, is become flat and tartish, as it is used, it should be drawn out of the cask into a jug, in which as many drachms of powdered chalk should be put as there are pints of liquor: thus a new ferment will be raised, a sprightly taste will be restored to the liquor, and its acidity will be destroyed.

The following method for *preserving ale from turning sour in long voyages*, was first published by Dr. Stubbs (Phil. Trans. No. 27), and experience has evinced its utility. To every runlet of five gallons, after being placed in a cask on ship-board not to be stirred any more, put in two new-laid eggs whole, and let them lie in it. In a fortnight or

a little more, the egg-shells will be entirely dissolved, and the eggs become like wind-eggs enclosed only in a thin skin; after this the white is preyed on, but the yolks are not touched or corrupted; and by these means the ale has been so well preserved, that it was found better in Jamaica than at Deal.

ALECTRA (the derivation unknown). Class 14, 2. Didynamia Angiospermia.

The Characters are,—*Corolla bell-shaped filaments, bearded; capsule ovate, obtuse, twin smooth, two-celled, two-valved, seedy, solitary, ovate.*

ALECTRA CAPENSIS (Cape Alectra). Thun. nova. gen. 82. *Root annual, stem simple, round, striated, erect, villose, a span or a foot in height. Leaves scattered, sessile, ovate, obtuse, erect, villose; the lower ones smaller; the upper one gradually larger. Flowers terminating in spikes, yellow, streaked with purple; spike leafy, flowering by degrees.* This plant has the habit of Orobanche; and grows black in drying. It is a native of the Cape of Good Hope, in grassy places near rivers; flowering in November and December.

ALECTRYON (from *allectryon*, a cock in allusion to the wing of the fruit having a crest like a cock's comb).

Class 8, 1. Octandria Monogynia. Nat. Ord. Sapindaceæ. Sect. 2 *Dodonæceæ*.

The Characters are,—*Berry coriaceous, globose, with a crest on one side, one-celled, one-seeded, seed erect, girded by an incomplete aril at the base; embryo spirally convolute.*

1. ALECTRYON EXCELSUM (Tall Alectryon). *Fruit with a crested wing at the apex. This species is a tree or shrub, the native country of which is not known.*

2. ALECTRYON CANESCENS (Hoary Alectryon). D. C. prod. 1. p. 617. *Fruit edged around with a wing.* In this species, which is a native of New Holland, on the eastern coast, the leaves are oblong, obtuse, and clothed with pubescence.

Mr. G. Don recommends (should these plants ever be introduced to our gardens, a mixture of loam and peat, or any light soil, and for cuttings, sand under a hand glass.

ALETIS (from *aleis*, meal, in allusion to the powdery dust with which the whole plant appears to be covered).

Class 6. 1. Hexandria Monogynia.

Nat. ord. of *Lilia* or *Liliaceæ*; *Coronaria*: *Lin. Asphodeli* Juss, *Hemerocallidæ*. Lind.

The characters are: *Flower funnel-shaped, wrinkled; Stamens inserted into base of segments; Capsules three-celled with many seeds.*

1. **ALETIS FARINOSA** (colic-root Aletris). Lod. Bot. Cab. 1161. *Flowers stalked oblong, alternate tubular; leaves broad, lanceolate mucronate.* The Aletris farinosa has a tuberous root, from which arise several lanceolate leaves, and a naked stalk supporting a spike of flowers placed alternately, of a greenish white colour; these appear in June, but are rarely succeeded by seeds in England.

This species is a native of North America, from New England to Carolina; according to Elliot, it is common in damp pine barrens. The Americans frequently use it in coughs, and in the pleurisy. It is perennial and quite hardy with us; the leaves, which are light green, are permanent; the flower stems are about two feet in height.

It increases itself slowly by offsets; should be planted in sandy peat, either in a pot or in the open border.

[Cultivated by Mr. Miller, in 1768.]

2. **ALETIS AUREA** (golden-tipped Aletris). Willd. ho. ber. 8. *Flowers sessile campanulate, Cor. in fruit rugose very rough; leaves lanceolate, ensiform acute.* A native of North America, flowering in July and August. The flowers are of a yellow colour. Propagation and treatment the same as the A. Farinosa. Introduced 1811.

3. **ALETIS FRAGRANS** (sweet-scented Aletris). *Cauliscent, leaves lanceolate loose.* Sweet-scented Aletris rises with an herbaceous stalk to the height of eight or ten feet, having many joints, and is adorned toward the top with a head of leaves which are of a deep green colour, and reflex at their ends, embracing the stalks with their base. The flower-stems arise from the centre of the heads, which are generally two feet high, branching out on each side, and fully garnished with white flowers, in shape somewhat like those of the second sort; but these open only in the evening, when they emit a most fragrant odour, but close again in the morning, and are not of long duration; but these are sometimes succeeded by

seeds, which, although fair to appearance, yet I could never raise any plants from them.

[It was cultivated in 1768, by Mr. Miller.]

The sweet-scented Aletris is too tender to live through the winter in England, unless it is placed in a warm stove; nor will it produce flowers if the plants are not plunged into a tan-bed; for although they may be preserved in a dry stove, yet they make but little progress there; in a tan-bed they will advance faster, the leaves will be much larger, and the whole plant much stronger; but the fragrant Aletris has not yet flowered here when kept in the dry stove.

It is easily propagated from the side-heads, which it puts out after flowering. These heads when taken from the stems, should be laid in the stove for a week, for their wounds to heal, before they are planted in pots, when they may be treated in the same manner as the others.

ALEURITES. (Ἀλευρίτης, farinaceous, various parts of the tree having a meal scattered over them: from ἀλευρον meal, from αλειω, molo.)

Class. 21. 8. Monoecia Monadelphia.

Nat. ord. of *Tricoccæ*. *Euphorbiaceæ*. Juss.

The characters are: **MALE**, *Calyx, three-fid, Petals 5, Scales 5, Filament columnar, Anthers numerous.* **FEMALE**, *Calyx three-fid, Petals 5, Scales 5. Style 0, Stigmas, 2, Berry dicoccous.*

ALEURITESTRILLOBA (three-lobed Aleurites). *Leaves three-lobed.* A handsome plant of easy culture, growing to the height of ten feet. A native of the Society Islands. Introduced 1793. Its qualities and uses are not yet ascertained.

Sweet says "Ripe Cuttings, with their leaves untouched, root in sand, under a hand-glass."

ALISMA (Ἀλίσμα Diosc. Alisma. Plin. said to be from Ἀλίσμα, anxiety: rather, as I should suppose by the orthography, from ἄλς, the sea). *Damasonium*. Tournef.

Class. 6. 5. Hexandria Polygнія.

Nat. ord. *Alismaceæ*.

The characters are: *Flower six-parted; the three outer sepals falling off late like a calyx; the thr. 6 inner petals, stamens 6, ovaries 3, finite in number, seeded capsules distinct not opening.*

1. *ALISMA PLANTAGO* (greater water plantain). Eng. Bot. 837. *Leaves ovate acute; Capsules bluntly three-cornered.*—This plant possesses the poisonous qualities of the ranunculi, to which order it is naturally allied. The *Great Water Plantain* is easily known by its fibrous and perenial root fixed in the mud under water.

Leaves all radical, erect, on long stalks, ovate, acute, entire ribbed, smooth, various in size and breadth, all standing out of the water. Flower-stalk rising frequently two or three feet above the surface, composed of numerous whorled, compound, spreading, bracteated branches. Each flower stands on a partial stalk, erect, composed of three short-lived jagged petals.

The germens are compressed, three-sided, ranged in a circle like those of the mallow tribe, each terminated by a crooked style. The capsules agree in form and position with the germens.

The flowers are fully expanded about four in the afternoon. It grows in watery places, on the banks of pools, lakes, and rivers, and flowers in July and August.

There is a variety of this with narrower leaves.

2. *ALISMA FLAVA*. *Leaves ovate, acute, peduncles umbellate, capsules globose.*—

This grows in Jamaica, Barbadoes, and several other places in the warm parts of America, in stagnant waters and swampy places; it would be difficult to preserve this plant in England, since it will not live in the open air, and requires a bog to make it thrive; but as it has no great beauty, or use, it is not worth the trouble of cultivating in this country.

3. *ALISMA DAMASONIUM* (star-headed water plantain). Curtis, lond. 5. 70. *Leaves cordate-oblong, flowers six-pointed, capsules awl shaped.*

Root-leaves on long flat footstalks, oblong-heart-shaped, reticulated with veins; stems naked. The flowers are white, in umbels, from which arise others, as it were proliferous in the same manner as in *A. ranunculoides*. Styles six, capules six, large, awl-shaped, divaricated, giving them a stellated appearance. They are of a hard texture, and so closely united at the base, as to appear like a single fruit.

It is a native of France, England, and Siberia; found in standing waters, if

they are not very deep; but is by no means so common as the first sort. If it be wanted as a medicine, it must be gathered in its natural place of growth, since it is never cultivated in gardens.

[4. *ALISMA CORDIFOLIA*. *Leaves heart-shaped, obtuse; flowers twelve-stamined; capsules hook-pointed.*—This species is the connecting link between this genus and that of *Sagittaria*. It is found both in South and North America.

5. *ALISMA PARNASSIFOLIA*. *Leaves heart-shaped, acute; petioles pointed.* Has the nature of the *Plantago*, the leaves are smooth, on long petioles, and scarcely acute. The petioles are scarcely jointed. The flowering shape is the same as in *A. Plantago*. The seeds are awned. Native of Italy; in the marshes under the Appennines.

6. *ALISMA REPENS* (creeping W.P.) *Leaves lanceolate, petioled acute.* Stems creeping, jointed, leafy at the joints, upright towards the top. Leaves three-nerved, shorter than the petiole, which is thickened towards the base: root-leaves numerous; stem-leaves shorter, two or four at each knot, where there are little brown scales embracing the stem, whence proceed two or three peduncles, sometimes one only, half an inch long, one-flowered. Leaflets of the calyx pale yellow. Petals crenate, pale purple; the claws narrowed, streaked, white. Filaments green, distributed in pairs at the claw of each petal: anthers incumbent, oblong, yellow. Germs coadunate in a ball.

Native of Spain, on the sandy banks of the river Manzanares: flowering in August. It seems to be the same (though much smaller) with the *Alisua*, which Abbe Poiret found on the northern coast of Africa, and which is described by Lamarck.

7. *ALISMA NATANS* (floating water plantain). Eng. bot. 775. *Leaves elliptical, obtuse, capsules striated.*

Flowers large, several from the same sheath, on very long peduncles. Capsules generally eight. The leaves which swim on the surface are ovate, but those which are under water are linear: this is the case with many aquatic plants, the motion of the water lengthening the leaves. It is found in ditches in France, Sweden, Germany, and Siberia; also in a lake or two in Wales. Is perennial, and flowers in July and August.

8. *ALISMA RANUNCULOIDES* (lesser water plantain). Eng. bot. 326. *Leaves linear-lanceolate, Capsules five-cornered incurved.* In a situation where the water is nearly dried up, this plant is from two to six inches high, the stems and proliferous umbels hardly longer than the leaves, and some of the flowering branches procumbent; but on the edge of old turf-pits, where there is plenty of water, it grows with an upright naked stem, from one to two feet high, bearing umbels of numerous rays, and these again others. The root-leaves in this state, are on very long foot-stalks, linear-lanceolate, not greatly exceeding the foot-stalk in breadth, and are extremely like the paddles of canoes of some of the South-sea islands. The corolla is bluish white, and opens about noon. It is a native of Sweden, Holland, France, Germany, Italy, and England, in marshes and moors; as on Giggleswick Tarn, Yorkshire; between Burton and Derby; Bungay, Suffolk; Ellingham fen, Norfolk.

9. *ALISMA SUBULATA.* *Leaves awl-shaped.* This species is a Virginian plant; the Dwarf Sagittæ of Clayton. It has a very tender white corolla, and subulate leaves.

ALKALESCENT, denotes a substance slightly *alkaline*, or in which an alkali is beginning to be formed and to predominate. As the volatile alkali, or ammonia, is the only one which is usually observed to be produced by spontaneous change, the term *alkalescent* generally refers to the generation of this alkali, in certain vegetable and animal substances by the process of *putrefaction* or any similar decomposition. Some species of vegetables, especially the tetradynamious plants have received the name of *alkalescent*, because, when placed in circumstances favourable to fermentation, they have a peculiar tendency to form ammonia, which may be separated in a very sensible quantity by the process of distillation.

ALKALI is the generic term for an order of salts of the highest importance, and the most familiar use in chemistry.

Alkali is a word of Arabian origin, and it was employed by the Arabian chemists and physicians, to express the salt which was procured from the ashes left after the combustion of several vegetables, particularly the salt *kali* of

the desert, and several plants growing on the sea shore. The same salt is also found native in immense quantities, mixed with sea salt, in the waters and on the shores of several lakes of Lower Egypt, and has been known, from time immemorial, by the name of *natron*, or the *nitre* of the ancients. The Greeks and Romans were equally familiar with the alkaline salt contained in vegetable ashes, which was termed *lixiviary ashes* (*lixivius cinis*, Plin.), whence the name of *alkaline ley*, *lixivium*, or *lixiviary salt*, which is still retained. The use of the word **ALKALI** was at first confined to the salt which was yielded by the *fixed* or incombustible ashes of vegetables; but the *volatile* salt, which rises in distillation of vegetable, and especially of animal matter, having been found to possess similar chemical properties with the fixed *lixiviary salt*, in the most essential particulars, the respective appellations of *fixed* and *volatile alkali* have long been adopted by chemists.

The properties common to all alkalis are the following:—1st,—They have a highly acrid taste, which acts with so much energy upon the tongue as to produce the sensation of burning, and unless they are much diluted, they very soon corrode the thin skin which covers it, and produce a small eschar or dead part, which, for a time, leaves a slight sore on that sensible organ. They have an unctuous feel to the finger, not from any oily nature in the alkalis, but because they directly dissolve the surface of the skin, and produce a kind of soap. 2ndly,—They effect a remarkable change on several vegetable colours. The red of roses, and the blue of violets, are turned by them to a dull green; the red of archill or litmus, to a blue; the yellow of tumeric, the light brown of jalap root, liquorice root, and of many other roots and woods, are all rendered much deeper in colour, approaching to a brick-red. They unite with sulphur, forming compounds which have the property of absorbing the oxygen from atmospheric air, and, when moistened, of giving out a peculiar fetid gas. These compounds have been denominated *alkaline hepars*, or *livers*, and in the modern nomenclature, *sulphurets*. They have a very powerful action on almost all vegetable and animal matters, producing speedy disor-

ganization, and dissolving them into a thick pulp. 3rdly,—They unite with oils and fats, and form, by this union, the well-known compound, *soap*. 4thly,—They are largely soluble in water, giving out heat on union with this liquid. They unite with every acid, and produce *neutral salts* of various degrees of solubility; in which, when the contents are mutually saturated, the distinguishing properties of both acid and alkali are neutralised, and no longer to be perceived. Owing to the very strong affinity which they bear for acids, they decompose the acid solutions of all metals and most earths. These are the most characteristic properties common to *all* alkalis; but there are others which are confined to one or other of the two species. These we shall enumerate.

The **VOLATILE ALKALI** (*Ammonia*) is distinguished, (as its name applies) by its volatility. The purest form in which it is known to us is that of a gas, which is permanent at any degree of cold that has ever been applied to it, and unites readily with water in large quantity, from which, however, it may be again expelled by a heat much below boiling. It has never been procured in a solid form, unless combined with some other substance; nor as a liquid, except by its union with water. It differs remarkably from the fixed alkalis in having a very pungent smell, which highly stimulates the nostrils, and excites coughing and tears. Owing to the ease with which it assumes a gaseous form, it is incapable of uniting with many substances which the fixed alkalis will dissolve, when assisted by fusion in a strong heat. The volatile alkali is weaker in all its affinities than the fixed. It is also the only one which is decidedly proved to be a compound substance; the nature of its constituent parts (which are hydrogen and azote) having been ascertained by numerous experiments both of synthesis and analysis.

The **FIXED ALKALIES** (*Alkali fuerbestandiges*, *Laugensalz*, Germ.—*Alcali fisso* Ital.) are the proper *lixiviar* alkalis, or those that are procured by lixiviation of the ashes of burnt vegetables. They may be obtained in a very pure solid form, either crystallized, or as a simple concrete. Besides the properties which have been mentioned

as common to all alkalis, these possess considerable fixity in fire, and at a red heat they run into thin fusion. A higher heat, however, volatilizes them, and they fly off in sensible vapour. The fixed alkalis, when in fusion, will readily dissolve siliceous earth into the perfectly homogeneous transparent compound, **GLASS**. They also will dissolve by heat all the metallic oxys, and thereby receive various tints. They assist in the fusion of all earthy and metallic admixtures, and their degree of fixity in the fire enables them to combine more intimately than the volatile alkali, with sulphur, phosphorus and charcoal. When pure and solid, they are remarkably deliquescent, absorbing water from every surrounding medium; and hence they have been used by chemists to render the air of any vessel in which they are confined, perfectly dry. The fixed alkalis are two in number, **POTASH** and **SODA**, the former being procured from the ashes of all vegetables except marine plants, and a few that grow near the sea shore, which yield the latter alkali. The former is also termed the *vegetable* alkali, and the latter (owing to its being sometimes found native in the earth) is called the *mineral* alkali. The general properties of these two alkalis were long known, and they were long employed in various arts, before the circumstances by which they are distinguished were well ascertained, and their separate existence established. The close resemblance which they bear to each other when pure, and the similarity in all their most remarkable chemical properties, prevented a proper distinction between them; and it was chiefly by the researches of Pott, Duhamel, and Margraaf, that the nature of the two alkalis was fully explained. The two neutral salts with which the older chemists were the most familiar, nitre and sea-salt, have for their bases, the former the vegetable, and the latter the mineral alkali; and it was principally by inquiries into the properties and decomposition of these neutral salts that the distinct nature of their alkaline bases was decided.

Potash and soda differ from each other in the strength of their affinity with acids, which is greater in the former; in some slight variation in their action on oils and animal fats;

but chiefly in the neutral salts which they form with the acids, which in all cases differ in form of crystallization, in solubility, often in taste, and in several other particulars.

The intimate nature of the fixed alkalis is still unknown to us. From the very strong analogy with the volatile alkali, the component parts of which are fully established, it must be considered as highly probable that the fixed alkalis are compounds, though their decomposition has not yet been effected by any experiments which can be allowed to be unexceptionable.

Sir H. Davy, having submitted potash and soda to the action of a powerful volcanic battery, observed that at the negative pole globules were collected, having metallic lustre; while at the positive side, a gas was disengaged, which proved to be oxygen. These results, Sir H. D. fairly inferred, arose from the decomposition of the alkalis, which he thence considered as compounds of metallic substances with oxygen.

Fixed alkalis have been supposed to be *generated* by the process of combustion of vegetables; since no plants, even those whose ashes yield the most of this salt, contain before combustion any sensible quantity of uncombined alkali. The accurate analysis of several of the modern chemists have however detected, in the native juices of plants, several neutral salts, whose alkaline bases are united to an acid which is easily destructible by fire.

ALKALI (Caustic or Pure). The alkaline salt procured from vegetable ashes, besides being mixed with other salts, and with earth, is always saturated more or less completely with fixed air, or *carbonic acid*; so that the fixed alkali which was the subject of the experiments of all the chemists, till within a few years, was a salt compounded of carbonic acid and the alkaline basis. The beautiful experiments of Dr. Black fully illustrated this point, and shewed, that the reason of the greatly increased causticity of alkalis, when mixed with quick-lime, was the loss of the carbonic acid, which had passed from the alkali to the earth. *Caustic* alkalis, therefore, are alkalis deprived of carbonic acid by quick-lime or any other method; and this is the only state in which, properly speaking,

alkalies can be considered as *pure*: though even when they contain much of this volatile acid, the peculiar qualities of the alkaline part predominate so considerably as to enable them to exhibit (though in a weaker degree) all the chemical properties by which alkalis are characterized.

ALKALI (Effervescent or mild) is opposed to the state of causticity, and expresses that degree of saturation with carbonic acid, which, as has just been mentioned, diminishes, but does not suppress, the characteristic properties of the alkali. Owing to the alkali obtained from vegetable ashes being always left after combustion in union with carbonic acid, *effervescence with acids* was considered by the older chemists as an essential character of alkalis in general, who thus ascribed to a property inherent in this genus of salts, an appearance which is now known to depend upon the expulsion of the gaseous acid. The terms *caustic* or *pure*, and *effervescence* or *mild*, are applied to the volatile as well as to the fixed alkalis.

ALKALI (Extemporaneous) is a mild vegetable alkali, prepared by deflagrating nitre with tartar.

ALKALI (Fluor) is a solution of pure ammonia in water.

ALKALI (Phlogistic) is prepared by calcining carbonated potash with bullocks' blood or other animal matter, in which process it unites with the prussic acid, formed during the calcination.

ALKALI (of Tartar), or Salt of Tartar, is properly a mild vegetable fixed alkali, prepared by the combustion of tartar, which yields it in great purity. The name is used more extensively for any pure carbonated potash, and it is the term by which this salt is more generally known in common language and in medicine.

ALKALINE EARTHS. It is by no means easy to draw the line accurately between alkalis and earths. The original idea of an *EARTH*, entertained by the ancient chemists, was that of a substance of considerable density, insoluble in water, without taste, smell, or any perceptible action on the organs of sense, entirely infusible, and fixed in the most intense fire; and, in short, with properties as opposite as possible to those of a *SALT*. This opinion principally attached to earth, considered

as one of the four elements of which the material world was supposed to be constituted. The progress of chemical investigation having, however, discovered several species of earths, which could not by any means be proved to be compounds, in which the simple or universal earth was so disguised as to lose some of its essential characters, it became necessary to alter and modify the original definition of an earth, and to allow to it more of a saline nature.

Some of the modern chemists, therefore, have adopted the term *salifiable*, and others *alkaline* earths, in order to allow of more accuracy in systematical arrangement. By *alkaline* earth has been meant an earth which agrees with alkali in the property of solubility in water to a certain extent, and thereby rendering it sapid, of changing to green certain blue and red vegetable colours; of absorbing carbonic acid with eagerness, and of possessing, when pure, those *caustic* or acrid qualities that so much distinguish the alkalies. *Magnesia*, *lime*, *barytes* and *strontian*, are the earths which may be termed alkaline, but the former is very imperfectly so, being scarcely more soluble in water than siliceous; and though its habitudes with carbonic acid are partly similar to those of the alkalies, it does not acquire any taste, or any degree of causticity, by the loss of this gaseous acid. Barytes and strontian, on the other hand, approach nearer to an alkaline nature than lime, in being very largely soluble in water, and readily crystallizable from its solution in a determinate form. They have therefore been actually enumerated as alkalies by Fourcroy, who reckons the following; *potash*, *soda*, *ammonia*, *barytes*, and *strontian*. The two latter even stand before the three ancient alkalies in their order of affinity with most acids, but, till the intimate nature of the fixed alkalies be fully cleared up, it will perhaps be proper to restrict the term *alkali* to the three above-mentioned, and to retain in the class of *alkaline earths*, *magnesia*, *lime*, *barytes*, and *strontian*, all of which, however they may be alkalies in many respects, differ from them in being unfusible *per se* in very intense fire, and being entirely incapable of being volatilized by the utmost heat that has ever been applied to them.

ALKALIMETER, in chemistry, a scientific instrument invented by Descroizelles, to measure the purity of different alkalies; it acts by ascertaining how many times their own weight they require in sulphuric acid to complete their saturation.

ALLAMANDA (from Mr. Frederick Allamand, a Dutch Surgeon, who went to Guiana, in 1769, and to Russia in 1776.

Class 5, 1. Petandria Monogynia.

Nat. ord. *Assocynææ*.

The Characters are,—*Capsules oval, lens-shaped, two-valved, the valves being boat-shaped; seeds imbricated.*

ALLAMARIDA CATHARTICA (willow-leaved Allamanda). Bot. Mag. 338. (the only species). *Leaves four together subsessile, ovate, oblong; flowers in villous fascicles.* This fine plant was named by Linnæus after his correspondent F. Allamand, a Dutch Physician, Aublet, who has given a representation of it by the name of *Orelia grandiflora*, found it in Cayenne and Guiana, on the sea coasts and the banks of rivers, growing among other trees and shrubs, and supporting itself by them to a considerable height. It flowers there in September, which is also the season for it in this country, into which it was introduced in 1785, by Baron Hake. The Capsule is large and prickly, containing a number of flat seeds; the whole plant is milky. The leaves are cathartic, and an infusion of them is used at Surinam, in the cholic.

It must be kept in the stove during the greater part of the year, and planted in loam and peat earth; it may be readily increased by cuttings.

ALLEY, derived from *aller*, to go, in gardening, signifies a narrow or confined path between beds, borders, or other compartments of a garden, and is chiefly formed for the convenience of going between them, in order to perform the necessary business, such as hoeing and weeding the plants, and also to cut, pick, and collect the plants or fruits. Alleys are made of different breadths, according to the sizes of the beds or compartments; but in general a breadth from one to two feet is sufficient. In extensive kitchen-gardens, where borders are carried round next the walks, and immediately adjoining the main quarters of the ground, they

should be divided from them by two-foot alleys, for the convenience of carrying in dung, water, &c. and the large compartments should likewise be divided by one or two cross alleys, with the same intention. Alleys between asparagus beds should constantly be two feet wide; those between strawberries, a foot and a half; but between beds of aromatic herbs, fifteen inches may be fully sufficient; and between beds of onions, leeks, carrots, parsnips, lettuce, endive, and all other small crops, the width of ten or twelve inches is as much as is requisite in general; and the same distance between beds of seedling and pricked-out cabbages, savoy, celery, &c. for the convenience of going in to weed, water, and draw the young plants for transplantation, will be the most convenient. Alleys are frequently intended both for use and ornament in flower-gardens; therefore, between beds of tulips, hyacinths, ranunculuses, anemones, and other similar garden-flowers that are bedded, they should in general be eighteen inches or two feet wide; and in order to have them ornamental, the beds should be edged with box, and the alleys filled with the best coloured fine gravel; or where that cannot be readily procured, with sand, shells, or other porous substances. (See Gravel Walks.)

ALLEY, in *Drill husbandry*, implies the vacant space between the outermost row of corn on one bed, and the nearest row to it on the next parallel bed. In the practice of drilling it was at first supposed that narrow alleys would not answer the end for which they were intended; while, on the other hand, the making them very wide would be a loss of ground; about four feet, exclusive of the spaces or partitions, between the rows of corn in the beds, was therefore considered as the most suitable and convenient distance. But as it is obvious, that it is not necessary to make the alleys so wide in good soils as in those of inferior quality, and that some sorts of crops require much larger spaces than others; the intelligent husbandman should always decide what breadth is the most proper in different cases, and for different purposes; one circumstance must, however, be duly attended to, which is, that wide alleys are more easily and much better stirred between than those that are narrower;

for, when an alley is wide, the large furrow in the middle of it may be cut deep, there being then sufficient room to turn the earth over towards the rows, while, on the contrary, the earth where alleys are narrow cannot be stirred deep enough, nor can room be found for what is turned over out of the furrows, without danger of burying some part of the rows of corn or other crops that may be cultivated. In hoeing these spaces the whole of them is not stirred, either with the plow or cultivator, when the crop appears; neither of these instruments should go too near the rows of corn or other crop, for fear of rooting up the rows of corn or young plants; but a slip of earth about six inches wide, is directed to be left untouched on the outside of each bed, by which means the part of the alley that is to be stirred will be reduced to the breadth of three feet; and even that space is lessened in the first ploughing before winter by a deep furrow, which is then cut close to, and all along those six-inch slips, and the earth taken out of each furrow is thrown into the great furrow in the middle of the alley, which it fills and arches up. These two side-furrows make together a breadth of about eighteen inches, and consequently leave, in the middle of the alley, a space of about eighteen inches more, on which is heaped up the earth thrown out of the two furrows; and thus the alleys are to remain during winter. By the first hoeing in the spring, the earth heaped up in the middle of the alleys is to be turned back towards the rows of corn. The two furrows that were opened before winter are then filled up, and a new one is cut in the middle of the alley. This business may be very easily performed with the common plough; two turns of that instrument being frequently sufficient for the purpose, one on each side of the alley, as near as possible to the beds. But when these two turns are not sufficient to form the furrows perfectly, or where too much earth remains between it and the bed, a third turn becomes necessary, and sometimes a fourth, in order to hollow the middle furrow as it ought to be. —When this work is performed with the cultivator with two mould-boards, the instrument must be placed in the middle of the alley, and the horses in one of the two furrows; the share readily

entering a great depth into the earth, which was laid there by the last hoeing before winter, the horses advancing, the ridge of the earth is divided into two parts, and fills up the furrows that were made before winter, on each side of the alley, close to the beds. Thus, the high furrow in the middle of the alley may be opened, and the whole operation performed by a single turn of the cultivator; by which so much time and labour is saved, that the farmer may afford one or two stirrings more in the summer, which will be of great utility in many cases.

ALLIARIA (from *allium*, garlick, in allusion to the smell of the leaves of this plant).

Class 15. Tetradynamia.

Nat. ord. *Cruciferae*.

The Characters are,—*Siliques roundish, four-cornered, with prominent nerves; Calyx lax.*

1. ALLIARIA OFFICINALIS (common garlick hedge mustard.) Eng. Bot., 796 (under *Erysimum Alliaria*). *Leaves cordate; pods prismatical much longer than pedicel.* The stem is upright, about a foot or more in height, leafy, a little branched in the upper part. Leaves alternate, on foot stalks, heart-shaped, broad-toothed, veiny, of a deep shining green, and very smooth. Flowers small with white entire petals, and the calyx also is whitish at the base. A notched gland embraces the base of each of the shorter stamina, and a smaller entire one stands without side of the longer stamina. Pods erect, long, quadrangular.

When bruised, the whole herb has a strong smell, which seems, as it were, the quintessence of the peculiar acrid flavour common to the cruciform plants heightened into that of garlick. Hence it has acquired the name of *sauce alone*, and from growing by hedge sides, it is called *Jack by the hedge*. Ray tells us the country people eat it with bread and butter. It is occasionally used as a salad, boiled as a pot herb, or introduced in sauces. Mr. Neil observes, "that when gathered as it approaches the flowering state, boiled separately, and then eaten to boiled mutton, it certainly forms a most desirable pot-herb; and to any kind of salted meat, an excellent green."

According to Linnæus's observations, horses, sheep, and swine refuse it; but

kine and groats eat it. If eaten by cows it gives a strong disagreeable taste to the milk. When it grows in poultry-yards, the fowls eat it, and it gives an intolerable rank taste to their flesh.

It is very common under hedges, and in other shady places, where it flowers in May. As the summer advances, the leaves turn yellow, and the plant soon dies, sowing its seeds in abundance. The young plants which spring up from them in autumn generally flower the next season, so that the root is more properly annual than biennial.

The leaves were formerly recommended internally as sudorific and deobstuent, of the nature of garlick, but much milder; externally as antiseptic, in gangreous and cancerous ulcers. The seeds excite sneezing.

2. ALLIARIA BRACHYCARPA (short-fruited garlick, hedge mustard). *Leaves ovate, roundish; pods lanceolate, the length of their stalk.* This species is a native of Siberia, about nine inches in height; flowering in May and June. Introduced 1824.

These plants are not, however, worth cultivating except in general collections; they are easily increased by seeds.

ALLIONIA (named in honour of Charles Allioni, professor of botany at Turin, &c. &c. author of *Flora Pedemontana*, and other works).

Class 4. 1. Tetrandria Monogynia.

Nat. ord. of *Aggregatæ Dipsacæ*. Juss.

The Characters are,—*Calyx common, oblong, simple, three-flowered; proper obsolete, superior; corollules irregular; receptacles naked.*

1. ALLIONIA VIOLACEA. Lin. spec. 147. Reich. 1. 289. Loeff. it. 181. *Leaves heart-shaped; calyxes quinquefid.*

Stem herbaceous, upright, weak, branched. Leaves opposite, acute, quite entire, smooth, the lower ones on long petioles. Flowers in a branched panicle, terminating with short little bractes. Corolla rather large, blue purple. Native of Cumana, in South America.

2. ALLIONIA INCARNATA. Lin. spec. 147. Reich. 1. 289. L'Herit. stir. nov. 4. 63. t. 31. *Leaves obliquely ovate; calyxes triphyllous.*

This is an annual, glaucous plant, with the habit of *Boerhaavia*. Root

branching, somewhat fibrous. Cotyledons petioled, roundish, spreading, flat. Stem usually three-parted at the base, somewhat branched, prostrate, round, villous, subviscid; branches alternate, more viscid, axillary from each second small leaf. Leaves as in *Boerhaavia hirsuta* opposite, one smaller than the other; the primordial ones in threes, petioled, oval, unequal at the base, bluntish or scarcely acuminate, repand, very loosely nerved, thickish, villous, scarcely scabrous, pale, glaucous beneath, purple at the edge, concave, spreading, 18—20 lines long, 10—12 broad; petioles round, villous, the length of the leaf. Peduncles solitary, axillary, one-flowered, filiform, villous, at first short, lengthening as they flower, nodding at the tip. Flowers flesh-coloured, three lines in length and breadth. Common Perianth three-leaved; leaflets ovate, acute, concave, viscid, villous, erect, from one to three lines in length. Universal corolla longer than the calyx, resembling a regular three-petalled flower, and two or three lines in breadth; each floret five-nerved, villous; tube the length of the calyx; border oblique, two-parted, unequal, the inner segment simple, acute, the length of the calyx, the outer longer, truncate, trifid, spreading, each segment two-toothed or emarginate. Filaments four, sometimes placed on the germ, sometimes inserted into the base of the corolla, capillary, erect, the length of the tube; anthers two-lobed two-celled. Germ inferior or between the calyx and corollule, ovate, somewhat compressed, with one angle on the inner side, quadrangular and glandulose on the outer. Style subfiliform, the length of the stamens. Stigma capitate, inclined. Calyx, when fostering the seeds, somewhat dilated, and loose. Seeds three, one to each floret, keeled, resembling the open jaw of a cat, or the leaf of *Dionaea Muscipula* when irritated; the length of the calyx.

Native of Peru, on rocks, and in sandy soils. Introduced into the Paris garden, from seeds sent by Dombey. It flourishes there, and perfects its seeds in the middle of summer.

ALLIUM (from the Celtic *all*, which signifies hot or burning; this is a genus of strongly scented plants, all of them edible, and some of them of the greatest

antiquity as pot-herbs.)

Class 6. 1. Hexandria Monogynia.

Nat. ord. *Spathaceæ*, *Asphodeleæ* Juss.

The Characters are,—*Flower six-parted, spreading, spathe, many-flowered; umbel clustered.*

1. STEM LEAFY, LEAVES NOT FISTULAR; *Umbel not bulbiferous; leaves flat.*

1. **ALLIUM AMPELOPRASUM** (great round-headed garlick). Eng. Bot. 1557. *Umbel globose; stamens three-cusped; sepals with a rough keel.*

The stem is solitary, four or five feet or more in height, having leaves at the bottom, eighteen inches or two feet long, glaucous and succulent: the spathe is conical, one-leaved, and deciduous; it flowers in a close ball on peduncles which are about an inch in length: the stamens are somewhat longer than the corolla, which is of a pale purplish colour. The whole plant has a strong disagreeable garlick smell. It is eaten along with other pot-herbs; it communicates its flavour to the milk and butter of cows that eat it; it grows naturally in the East, in Switzerland, on the Holms island in the mouth of the Severn, &c.; is perennial, and flowers with us in July.

2. **ALLIUM PORRUM** (the Leek), Blackw. t. 421. *Stamens tricuspidate, root-tunicated.* The leek may be said to be an annual-biennial plant, for although the roots often survive, after perfecting seeds, yet the plants always attain perfection the same year they are sown, and the year afterwards run up to stalk and become unfit for use. The seed-stalk of this plant does not belly like that of the onion. It flowers in close large balls on purple peduncles, in April or May. The stem or scape is three feet high or more, leafy at bottom. Leaves an inch wide, with the edge smooth, shortly conical deciduous.

Tusser, in his verse for the month of March, says—

“Now leekes are in season, for pottage full good,
And spareth the milck cow, and purgeth the blood:
These hauing with peason, for pottage in Lent,
Thou spareth both otemel, and bread to be spent.”

Gerard, who wrote soon after this time, mentions leeks in such a manner

as to induce us to think them indigenous to our soil: he says leeks are very common every where in other countries as well as in England." And they appear to have been used by the Welsh as far back as we can trace their history.

"March, various, fierce, and evil with
wind-crack'd cheeks,
By wilder Welshmen led, and crown'd
with leeks."

The Welshmen still continue to wear leeks on St. David's Day in commemoration of a victory which they obtained over the Saxons in the sixth century, and which they attribute to the leeks they wore by the order of St. David, to distinguish themselves in the battle. This Welsh patron who died about the year 544, governed the See of St. David's sixty-five years, having founded several monasteries, and having been the spiritual father of many saints, both British and Irish.

Some authors affirm that the symbol of the leek, attributed to St. David, originated in the custom of Cymortha, which is still observed among the farmers of the country; where in assisting one another in ploughing their land, they bring each their leeks to the common repast. Leeks require a richly manured ground, and will not prosper in wet situations: their qualities are nearly the same as those of the onion and garlic, and they are best when used in moderation.

The best of the varieties of this plant for general culture, is the broad-leaved or London leek, which attains a large growth, the neck acquiring a thick substance, in length from 6 to 9 or 10 inches, dividing upwards into many large, long, thick leaves, arranging themselves in somewhat a fan shape.

The narrow-leaved leek runs up with a long thin neck, and narrow thin straggling leaves, which, as a degenerate variety, does not deserve culture, and the striped-leaved kind is retained merely for variety, which may be continued by suckers rising from the old roots.

Propagation, Culture, &c. The common leek is raised annually from seed sown in the Spring; the proper time, for the general crop for Autumn and Winter use, is the same as that recommended for the onion, as from the twen-

tieth of February to the end of March; but for later crops to stand for Spring use, any time in April may answer, or for a small crop to stand as late in the following Spring as possible, without running to seed, the beginning of May.

It is a common practice, from the notion of making the most of the ground, to sow leeks along with the crops of onions; which should not by any means be recommended, as experience has shewn it to be considerably the best culture to keep them separate. It is often practised by the market gardeners, when intending to cull out the onions from time to time for market; so that by a daily thinning, they are mostly all cleared off by the end of July; and those being gone, the same ground remains occupied by a crop of leeks. This method cannot be practised to equal advantage in the main crops of onions that are to stand to grow to full size for keeping. The best culture, therefore, for the general crops of leeks, is to sow them pretty thick in a spot by themselves to be afterwards transplanted, either wholly or the greater part thinned out regularly and planted; the others being left at good distances for full growth, and the same situation, soil, and method of sowing are to be adopted as directed for the onion. In June, July, and August, the plants will be of a proper size for transplanting; in doing which make choice of an open spot of the best ground; if dunged it will be of much advantage, digging in the dung one spade deep; then drawing a parcel of the largest leeks, and trimming their tops and the extreme parts of their root-fibres, proceed to plant them by line and dibber in rows, which for the early crop should be twelve inches distant, and eight or nine inches apart in each row; and for better crops nine inches between the rows and fix the other way, putting them three or four inches in the ground, or nearly to the length of their necks, and watering them immediately. The only culture they require afterwards is to be kept clear from weeds, which may be done either by hand-weeding, or more expeditiously by applying a sharp hoe in a dry season.

The leeks thus cultivated are generally finer than those that remain where sown, their necks, which is the principal

esulent part, are much longer, and all the part within the earth is finely whitened and rendered mild and tender, which is a desirable property in this plant. However, when it is intended to raise a crop of leeks in good perfection, to remain where sown till their full growth, the seed should be sown much thinner; and when the plants are somewhat advanced, as in June or July, they should be regularly thinned to about ten or twelve inches distance; those thinned out being planted in another compartment of the garden. The remaining plants will by this means attain a larger and thicker growth below, with large spreading tops of thick fleshy leaves.

This is a valuable family plant from Autumn till Spring, for soups, broth, &c., and for boiling the neck part and top leaves together, to use as greens, in the manner of coleworts, &c. to eat with flesh-meat. It is in perfection from September till May, when it shoots up to stalk for seeding.

In order to save the seed of this plant, a quantity of the finest plants should be transplanted in February into a sheltered sunny bed or under a south wall, paling hedge, or other fence. This is mostly necessary, as the seeds ripen late in the Autumn, and unless assisted by such situation and shelter, seldom ripen freely in this climate. In this view it would be of particular advantage to plant some in a row close under a south fence, at ten or twelve inches distance; they will then shoot up their stalks considerably in May, and in June attain two or three feet in height, when they should be supported, and continued in an upright growth. In July the flowers protrude from their sheath at the summit of each stalk, and form a large globular head; and in September the seeds begin to ripen. After this is effected, cut the heads with part of the stalk and tie them in small bunches, hanging them across lines in a dry airy apartment, two or three months, when the seed will be hardened, and the capsules readily break by threshing or rubbing, and thus discharge it more readily from the cells in which it is lodged.

3. *ALLIUM LINEARE* (linear-leaved garlic). Gmel. sib. 1. t. 13. *Umbel globose, stamens tricuspidate twice as long as the flower.* This grows natu-

rally in Siberia. It has narrower leaves than the common leek, the stalks are smaller, and do not rise so high; the heads of the flowers are also smaller, and of a purple colour. It is called by Miller, *Porrum Ampeloprasum*. He cultivated it in 1768.

4. *ALLIUM SAUVECOLENS* (sweet-smelling garlic). Jac. ic. 2, t. 364. *Umbel capitate; stamens subulate, twice as long as flower.* This species is a native of Austria, flowering in June and July: flowers white. It is perennial, and may be increased by offsets. Introduced 1801.

5. *ALLIUM VICTORIALIS* (long-rooted garlic). Bot. mag. 1222. *Umbel capitate, stamens lanceolate, longer than flower, leaves elliptical.* Grows on the mountains of Switzerland, Austria, Silesia and Savoy. The wild plant has the root-leaves half an inch broad; transplanted into a garden, the leaves grow to four inches in breadth, without becoming much longer. The stem is from a foot to eighteen inches in height. The petals are of a dirty white, with a tincture of green, sometimes suffused with red; the whole plant, when bruised, has a very rank scent of garlic. The root, when worn, was considered by the Bohemian miners as an amulet, and as a safeguard against the attacks of certain impure spirits, to which they deemed themselves exposed; among them it was surnamed *Siegourz* (Root of Victory), hence *Victorialis*. By the shepherds of other districts it has been used internally as a preservative against the effects of fogs and noxious exhalations; a purpose to which every species of garlic is more or less adapted. Cultivated in 1739, by Mr. Miller.

6. *ALLIUM SUBHIRSUTUM* (hairy garlic). Bot. mag. 774. *Umbel fastigiate, stamens subulate, leaves linear ciliated.* This species has been found throughout the south of Europe; also in Barbary, and at the Cape of Good Hope. The bulbs are small; they produce their flowers in May; these are of a pure and dazzling white, and may be considered the most beautiful of this numerous family. It is easily preserved in a pot, with a slight shelter, or in mild winters remains very well out of doors. The soil should be sandy loam. It increases rapidly by offsets. Intro. 1596.

7. *ALLIUM OBLIQUUM* (oblique-leaved garlic). Bot. mag. 1408. *Stamens*

Aliform, thrice as long as the flower, leaves oblique. Grows from one to three feet in height, with a cylindrical stalk; bulb scarcely of greater circumference than the stem, with its sheathing leaves, of which it appears a mere continuation. The leaves are channelled, and have round sheaths. The flowers grow in a globose umbel, of a greenish yellow colour, rather small. The Spathe also is globose, purple and acuminate. The petals are ovate, erect, concave, yellow, with a green keel; the filaments whitish, with yellow anthers; the germ sub-globose. The whole plant, when bruised, emits a very rank smell of garlic. Blooms in May: hardy. Native of Siberia. Cultivated before 1768, by Mr. Miller.

8. *ALLIUM MAGICUM* (Homer's garlic). Bot. mag. 1148. *Cauline leaves lanceolate; umbel dense depressed; stamens subulate, shorter than flower.* This has a weak, cylindric scape, from one to four feet high, the root-leaves broad, channelled, and obtuse. Corolla white, sometimes with a purple and green, at others with only a green tint on the outside. Flowers in June and July. It is quite hardy. Cultivated in 1596 by Gerard, and preserved by many persons in the gardens for the sake of variety, but it has a very strong scent. Native of the south of France, Italy, Syria, the coast of Barbary, Spain and Portugal; Jacquin doubts if it is really indigenous of Austria. Easily propagated both by seeds and offsets.

9. *ALLIUM ROSEUM* (Rose-coloured garlic). Bot. mag. 978. *Umbels fastigiate; sepals emarginate; stamens, very short, simple.* Leaves linear, scarcely so long as the scape, which is cylindric. Spathe obtuse. Flowers larger than in any of the rest, and dark purple. Stamens white and very short. It grows naturally about Montpellier and in Piedmont, in the fields, olive-grounds and vineyards. Cultivated in 1752, by Mr. Miller.

[10. *ALLIUM DEFLEXUM* (deflexed garlic). *Stamina three-pointed as long as flower; leaves very narrow; scape declinate.* A pretty species with pale purple flowers. It is about six inches in height; flowers in June and July. Perennial, may be increased by offsets planted in common garden mould. Introduced 1820.

11. *ALLIUM STRICTUM* (upright gar-

lick). *Very upright; leaves channelled.* Perennial, flowering in July. The plant is about one foot in height; flowers of a pink colour. It is increased by offsets planted in common garden mould. Introduced 1821.

12. *ALLIUM NEOPOLITANUM* (Neapolitan garlic). *Umbel loose few-flowered; leaves smooth.* The bulb is roundish, small, and slightly streaked. Leaves one or two, scarcely sheathing the base of the scape, smooth and even, plaited, commonly higher than the scape, bright green. Scape from a foot to two feet high, the end of it constantly nods before the flowers expand. Umbel thin, equal, consisting of from twelve to twenty flowers, frequently nodding. Spathe single, subovate, corollas white, spreading; stamens shorter than the corolla.

It is cultivated in the gardens near Naples, and flowers in March. Introduced 1823.

13. *ALLIUM CILIATUM* (ciliated garlic). *Very like Allium subhirsutum, differing only in the smallness of the flowers; sepals three lines long.*—It is perennial, a native of Naples, with white flowers. The plant generally is about nine inches high, may be increased by offsets. Introduced 1820.

Umbel not bulbiferous; leaves not flat.

14. *ALLIUM TATARICUM* (Tartarian garlic). Bot. mag. 1142. *Stamens simple; umbel flat; Leaves half-rounded.* The stem is cylindric, smooth, half a foot high, leafy towards the base. Leaves channelled, smooth, scarcely shorter than the stem. Spathe bivalve, roundish and withering. Corolla flat, white. Filaments shorter than the petals, with brown anthers. There can be no doubt but that this is the *umbellatum* of Haller; scarcely any of it being Gmelin's above-cited plant, and as his figure corresponds well with the specimen of *ramosum* in Linnaeus's Herbarium, this species of that author likewise. The specific name of *ramosum* seems to have had its rise from Gmelin's remark, that it has often besides the fertile scape, a kind of false branch or sterile excrescence, which he calls "*crus solidam terne*"; an excrescence which is often seen to issue from the middle of the umbel of other species. Both authors describe the stamens of their plant as longer than the corolla, while the figure given by the

one and cited by the other shows the reverse to be the fact.

A very common plant in most parts of Siberia. Introduced into Kew Gardens by Mr. Haner in 1787. Blooms in May and June. The flowers are sweet-scented; but the plant, when bruised, emits a very rank smell of garlic. Varies greatly in the number and closeness of the radii of its umbel. It is one of the most ornamental of the genus.

ALLIUM DECENDENS (purple-headed garlick). Bot. mag. 251. *Outer peduncles shorter than the rest; stamens three-pointed.* It usually grows to the height of three feet, thriving in almost any situation or soil; its flowers grow in a capitulum or little head; this head is at first covered with a whitish membrane, wearing some resemblance to a night-cap, on the falling off of which the whole of the capitulum is perceived to be of a green colour, shortly the crown of it becomes of a fine reddish purple, this colour extends itself gradually downwards, presently we see the upper half of the head purple, the lower half green; in this state it has a most pleasing appearance; the purple still extending downwards, the whole head finally becoming uniformly so, and then its flowers begin to open, and emit an odour rather agreeable than otherwise. Native of Switzerland and Italy. Cultivated in 1776, in the Oxford garden. This species increases readily by offsets, which should be separated and planted in Autumn.

We know not why Linnæus should give it the name of descendens, unless from its being one of the plants whose roots in process of time descend deeply into the earth.

16. ALLIUM FLAVUM (sulphur-coloured garlick). Bot. mag. 1330. *Flowers pendulous; sepals ovate; stamens longer than flower.* Bulb with but a slight degree of the usual flavour of garlic; stalk leafy, round, glaucous. Leaves round, not angular, flattish above the base; sheath twice as long as the umbel, one valve leafy. Umbel with pendulous yellow pedicels, petals deep yellow, obtuse, concave, erect: stamens simple, twice as long as the corolla: style short. Gouan and Gerard think this to be a variety of the last. It differs from *paniculatum* and *pallens*, to both of which it is closely allied;

from the first by its glaucous leaves and yellow umbel, as well as the roundness of the former, which are not strongly striate or ribbed on the back as in *paniculatum*; from the second by the far greater proportionate length of both stamens and style. Native of the south of France, Italy, and Austria. Cultivated in 1768, by Mr. Miller.

17. ALLIUM PALLENS (pale-flowered garlick). Bot. mag. 1420. *Flowers pendulous, truncated; stamina, simple, as long as flower.* Stem smooth, three feet high: leaves alternate, seven-cornered, erect: spathe awl-shaped, nervose: corolla bell-shaped, white; petals obovate, very obtuse, erect, concave, with a green keel; scarcely any style, till after the time of flowering, when it is still very short. The flavum is very like this, but differs in the petals being ovate, and of a deep yellow, and the stamens with the pistil being twice as long as the corolla, instead of being shorter as in this.

It differs also from the *paniculatum* in being generally a far taller and more robust plant; by flowers of a dirty yellowish white, and not pale rose colour; by these having no scent; by stamens that do not at all overtop the segments, as well as by a style that is never equal to the germen in length. Native of Italy, Spain, Montpellier, and Hungary. Introduced in 1779, by Abbe Poirer.

18. ALLIUM PANICULATUM (panicled or pendulous flowered garlick). Bot. mag. 1432. *Peduncle capillary effuse; stamens simple, spathe very long.* The leaves are awl-shaped and channelled: the flowers hang on very long, loose, slender peduncles; the petals are purple, obovate, the length of the stamens; the spathe has a very long awl-shaped point. From *Oleraceum* it differs, by having the filament shortly connate at their base among themselves, and with the corolla. The bloom of the present plant has a slight degree of fragrance, in white with a slight suffusion of purple or rose-colour. and marked with green down the backs of the segments. Native of Italy, Austria, Switzerland, Carolina, Siberia, and the Levant. Introduced in 1780, by Sign. Giov. Fabroni. Gerard joins this with the foregoing.

19. ALLIUM CAUCASICUM (Caucasian garlick). Bot. mag. 973. *Stamens simple, twice as long as flower; spathe as*

long as Flower-stalks, one valve shorter. A native of the south of Europe and the Levant. It is sometimes bulbiferous, at others entirely without bulbs. Introduced into our gardens by Signor G. Fabroni, in 1780.

20. *ALLIUM RATUNDUM* (round-headed garlick). *Umbel globose; stamens three-pointed; flowers lateral nodding; leaves half round.* The root is made up of many purple and black bulbs, crowded between white common sheaths, scape three feet high; leaves grassy, three lines broad; spathe short. The outer petals gibbous downwards, more acute, purple, with a distinct line of a darker colour; the inner paler, erect, without any eminent line; the stamens project beyond the corolla; has the fruit and seeds like those of the leek. (n. 2.) Native of the southern parts of Europe.

21. *ALLIUM GLOBOSUM* (globose garlick). Gmel. sibl. t. 10. *Stamens simple, twice as long as Flower; umbel globose; spathe subulate, very long.* This species is perennial, a foot or more in height, with purple flowers, which it produces in August and September. Increases readily by offsets, which may be planted in any common garden soil. Introduced 1821.

22. *ALLIUM MOSCHATUM* (musk-smelling garlick). Wald and K. l. t. 68. *Umbel fastigate about six-flowered; sepals acute; stamens simple; leaves setaceous.*—Bulb small, oblong, rufous, covered with a netted bark. Stem slender, seldom attaining a foot in height. Leaves rushy, from an inch to three or four inches in length. Flowers five, six or seven, pedicelled, in an umbel; corolla dusky white with brown lines, smelling like musk or civet. It grows wild in Provence, Narbonne, and Spain. Casp. Bauhin relates, that Saltzmann brought him the plant from the hills about Montpellier, in 1598, and that he cultivated it in his garden. Introduced 1823.

23. *ALLIUM GUTTATUM* (spotted garlick). *Umbel globose, very dense; spathes lanc. as long as flower-stalks; Stam. three-pointed, longer than fil.; leaves half round.*—Brought originally from Odessa. It is a foot and half high, with white flowers; flowering in July. Offsets planted in common garden mould, thrive well. Introduced 1819.

24. *ALLIUM RUPESTRE* (rock garlick).

Flower-stalks nearly equal; sepals ovate, conniving as long as simple stamens; style longer than stamens.—A native of the Crimea, with purple flowers. It is a foot and a half high, flowering in June; increased by offsets, which may be planted in any common garden soil. Introduced 1824.

25. *ALLIUM PUSILLUM* (diminutive garlick). *Spathes ovate, shorter than umbel; Stamens simple, shorter than Flower.*—This sort, which generally grows to about six inches in height, is a native of Siberia. It produces its pretty pink flowers in June. May be increased by offsets planted in common garden soil. Introduced 1821.

26. *ALLIUM SPHACROCEPHALON* (small-headed garlick). Bot. mag. 1764. *Leaves half-round; Stamens three-pointed longer than flower.*—In this species the stems are glaucous, not streaked, smooth, round. Leaves flat above, convex below, becoming semi-cylindrical and channelled, as long or longer than the stem. Spathes not tailed, one larger than the other, and bifid. Head of a short conical form; the peduncles lengthening towards the middle, and forming a close imbricate umbel. Petals red with a darker keel, permanent, and becoming more convergent, ovate, the outer ones shorter and narrower; not awned. Filaments purple towards the top. Style purple within, very long. Stigmas yellowish. It bears capsules.

Native of Italy, Germany, Switzerland and Siberia. It was cultivated in 1759 by Mr. Miller.

27. *ALLIUM PAROIFLORUM* (small-flowered garlick). *Umbel globose; stamens simple, longer than flower; spathe subulate.*—Bulb oblong; stem cylindric, streaked, leafy; leaves almost the length of the stem, awl-shaped; flower very small; outer petals ovate, dark-coloured, inner twice the length, lanceolate, purple; spathe two-leaved. Native of the South of Europe. Introduced in 1781, by Mons. Thouin.

28. *ALLIUM CARNEUM* (flesh-coloured garlick). *Umbel sub-globose; stamens three-pointed, shorter than flower; umbel bulbiferous; leaves flat.*—Indigenous to the South of Europe, where it attains to more than a foot in height; flowering in June and July; increased by offsets. Introduced 1816.

29. *ALLIUM ARENARIUM* (sand garlick). Eng. bot. 1358. *Sheaths of*

leaves rounded; spathe blunt; stamens three-pointed.—Sand garlic is distinguished from the last species by its round sheaths, and by its growing all-ways in a sandy soil: bulbs, which are numerous, and blossoms are blue; stamens a little longer than the blossoms; leaves three or four, lower ones quickly withering, broad, edges hairy, or rather finely toothed, teeth not discernable without a glass; leaf-sheaths strongly keeled; stem two to five feet high; flowers few, on short stalks, small, purple, marked with a deeper line: it grows wild in Thuringia, Scania, Denmark, Switzerland, Italy, and in the woody and mountainous parts of the north of England, particularly about Louth in Westmoreland, Castle Howard in Yorkshire, Thorp-arch, and Heslington-fields near York. It is perennial, and flowers in July.

30. *ALLIUM CARINATUM* (mountain garlick). Eng. bot. 1658. *Umbel spreading; peduncles nodding.*—Mountain garlick has awl-shaped stamens; very long (acute, Smith) spathe; stem, when cultivated, four feet high; leaves a foot long, not half an inch broad, sheath-leaves two, awl-shaped, unequal; umbel has few flowers but many bulbs, which fall off and vegetate; blossom of a dull brown yellow colour, often changing to purple; the plant has but little of the garlick smell: it is found wild in Scania, Germany, Carniola, Italy, and Switzerland, and also in the rocky and mountainous parts of the north of England, near Settle in Yorkshire, in Heslington-fields near York, and about Knaresborough, on the rocks about Longsedale in Westmoreland, near Bamsgate in the isle of Thanet, and between Sandwich and Deal; it is perennial, and flowers in July.

31. *ALLIUM CONTROVERSUM* (barren garlick). *Flowers all male; stamens three-pointed; spathe with a very long point.*—It is a foot in height, with purple flowers; flowering in June and July. Increased by offsets. Introduced 1816.

32. *ALLIUM SATIVUM* (cultivated garlick). Moris, 4. t. 15. f. 9. *Bulbs compound; stamens three-pointed.*—This plant is the *Skorodon* of the Greeks. The Latin name *Allium*, is thought to have its origin from the Greek word *Anesthia* exile, to leap forth, from the rapidity of its growth. Garlick has been subject to the same whims of fashion as have

attended its near relation to the onion. The Egyptians worshipped it; but the Greeks held it in such abhorrence, that those who ate of it were regarded as profane. Persius relates, that they made criminals eat of it for several days to purify themselves from crimes. The Romans gave it to their labourers to strengthen them, and to their soldiers with an idea that it excited courage in warriors. They also fed their game cocks with garlick previous to fighting them.

Every part of the garlick, but more especially the root, has an acrimonious and almost caustic taste, it abounds in sharp subtle particles, which render its odour so powerful and penetrating, that if it be applied to the feet, its scent is soon discovered in the breath, and when taken internally, its smell is communicated through the pores of the skin even to the fingers. Hence in cold and phlegmatic habits it proves a powerful expectorant, diuretic, and emmenagogue, and if the patient is kept warm, a sudorific.

This pungent root warms and stimulates the solids, and attenuates tenacious juices, by its penetrating powers. It is said that, if a clove of it be kept in the mouth, it is an effectual preservative against infection. The Hungarians esteem it the most efficacious preventive against pestilential disorders.

When made into an unguent with oils, and applied externally, garlick is said to resolve and disperse cold tumours; and it has been by some greatly recommended in cutaneous disorders. The acrimonious qualities of this root, however, render it manifestly improper upon many occasions.

Pliny states, that garlick is a sovereign medicine for many maladies, especially such as are incident to country peasants and labourers. He recommends those who wish to keep garlick and onions from sprouting, to dip the heads of them in warm salt water.

The strong offensive smell of this plant is so powerful, that if it be given to fowls with their food, their eggs will taste of the flavor.

Menander states, that if you have taken garlick, and wish to sweeten your breath, the eating of baked beet-root will entirely take off the offensive smell.

If garlick be boiled, and given to

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chickens with their food, it will generally prevent that pest of the feathered tribe, the pip.

The Common Garlick has a large round white bulbous root, of an irregular form, with numerous fibres at the bottom, composed of many smaller bulbs denominated cloves, which are included in a common membranous covering; each of which, being planted, grows, and in one season attains the size and structure of the parent bulb; the leaves are cauline, or form a kind of stalk, which seldom spindles, except when the same roots remain in the ground two or three years, when they run up, and bear a flower, and small bulbs at the top. It deserves to be cultivated in the garden for the sake of its root, which is in great estimation for culinary and other domestic purposes.

It is constantly propagated by the small bulbs that constitute the main root, which may readily be divided into a great number of separate cloves; these are to be planted in the spring, in beds four feet wide, a little raised in rows lengthwise; from six to nine inches asunder, and the rows six inches asunder, and two or three inches deep. The planting may be performed by a blunt dibble, or by drills in which the cloves must be placed, and afterwards covered with earth; when planted in this way, their leaves usually shoot up in a month or six weeks; requiring afterwards only to be hoed with a small hoe to kill the weeds.

About the end of July or beginning of August, the bulbs are generally full grown, as is indicated from the yellow appearance and withering of the leaves. They should then be taken up, cleaned, dried in the sun, and after tied or plaited in bunches, hung up and preserved for use.

33. *ALLIUM SCARODOPRASUM* (Rocambole). *Leaves crenulate; sheaths two-edged; stamens three-pointed.*—Rocambole is found wild in Sweden, Denmark, Germany, and Hungary, and cultivated here by Gerard in 1596; it has compound bulbs, but much smaller than those of garlick; the root is heart-shaped, solid, and generally stands sideways of the stalk; the leaves are rather broad and crenated at the edges; the flowers, which are collected into a sort of globular head, are of a pale purple colour; the stem generally rises

from two to three feet in height, and produces many small bulbs at the top, that may be made use of as well as those of the root.

Rocambole may be propagated either by the roots, or the bulbs produced on the stalks; they should be planted in autumn, especially on dry ground, otherwise their bulbs will not be large. They are to be planted and prepared for use in the same manner as garlick.

34. *ALLIUM MONSPESSULAN* (Montpelier garlick). *Like A. carinatum, but the stamens are three-pointed.*—A native of the south of France, with pale purple flowers, which are produced in June. This species, which is a foot in height, may be increased by offsets planted in common garden mould. Introd. 1822.

35. *ALLIUM VIOLACEUM* (violet garlick). *Stamens subulate, twice as long as flowers; spathe longer than umbel.*—This species, which produces its violet-coloured flowers in June, is a native of the south of Europe. Increased by offsets. Introduced 1823.

Umbel bulbiferous; leaves not flat.

36. *ALLIUM FETIDUM* (stinking garlick). *Leaves half-round; spathe much longer than umbel; sepals obtuse; stamens simple, exerted.*—This species, which is about a foot in height, produces its dark purple flowers in July; and may be increased by offsets.

37. *ALLIUM VINEALE* (crow garlick). Eng. bot. 1774. *Stamens, three-pointed, longer than the petals, the capillary lateral extremities of the three trifid ones, longer than the part which bears the anther, and spreading horizontally.* The root is a small ovate white bulb; stem two feet high, upright, slender, round, striated, leafy. Leaves long, tapering, cylindrical, hollow, ribbed, smooth, fading before the flowers come out. Umbel small, with abundance of little ovate acute greenish bulbs, intermixed with a smaller number of capillary, smooth, purplish, flower stalks, club-shaped at their summit.

This garlick is found in dry fields, more particularly on a calcareous soil, as well as about old ruinous buildings, flowering in July. The petals are closed, of a pale rose-colour, with green keels. The crow garlick, if eaten by birds, stupefies them so much, that they may be taken by the hand.

38. *ALLIUM OLERACEUM* (purple-striped or streaked field-garlick). Eng.

bot. 488. *Leaves rough, half round, furrowed beneath; stamens simple.* Bulb the size of a hazel-nut; stem round, slender, leafy, near two feet high. *Leaves* sheathing at their base, a foot long, narrow, dull, green, flat or channelled above, convex and ribbed beneath, appearing under a magnifier rough all over. *Umbel* simple, terminal, erect: spathe of two concave membranous valves, each terminating in a long spreading leaf-like point, extending far beyond the flower-stalks, which are slender, divaricated, single-flowered, intermixed at their base with numerous little ovate purple bulbs, which falling to the ground become new plants, according to the bountiful provision of nature, for this and many other species of *Allium*, by which they are propagated without end. *Segments* of the corolla, equal, ovate, greenish white, with three purple lines: *stamina* simple (not toothed), connected by one common base. *Germen* with six furrows, rough at the top. The whole herb has the foeter of garlick; the bulb has less of that scent than many others. It is a very troublesome weed, though fortunately of rare occurrence. It is perennial, flowering in July.

2. LEAVES RADICAL, NOT PISTULAR.

39. *ALLIUM ODORUM* (sweet-scented garlick). *Scape*, *umbel* many-flowered, *fastigate*; *leaves* linear, channelled, angular beneath; *stamens* subulate. *The Sheath* short, with rudiments of membranes between all the peduncles, which are many, erect, longer than the flowers. *Corollas* white, sweet smelling; petals ovate-oblong, rather acute, from erectish spreading, with a reddish keel. *Stamens* simple, half the length of the corolla. *Germen* ash-coloured, dotted with holes: style white. *Leaves* connate at the base into a bunch, scarcely fleshy, by no means rough. *Scape* a foot high, round or with one obscure angle, erect. Native of the south of Europe, China, Japan, &c. Introduced 1820.

40. *ALLIUM ATROPURPUREUM* (dark purple garlick). *Wald. and K. l. t. 17.* *Scape* rounded; *leaves* linear lanceolate; *umbel* fastigate; *sepals* very narrow; *stamens* simple. A native of Hungary. The flowers which, are of a dark purple are produced in July. The plant is about a foot in height. Increased by offsets. Introduced 1821.

41. *ALLIUM NIGRUM* (black garlick). *Scape* rounded; *leaves* lanceolate; *umbel* hemispherical; *sepals* spreading; *stamens* simple.—Resembles the *A. senescens*, but is twice the size; has the leaves of *Narcissus*; flowers four times larger than in the *senescens*; petals white, ovate-oblong; *stamens* lanceolate, shorter than the corolla; spathe ovate, acuminate, divided almost to the base into two equal parts. Native of Provence, Italy, Austria, and in the neighbourhood of Algiers. Cultivated in 1759, by Mr. Miller.

42. *ALLIUM CASPIUM* (Caspian garlick). *Scape* rounded; *leaves* linear, lanceolate, wavy; *umbel* hemispherical, roots very long; *stamens* simple, twice as long as filaments.—It seldom attains to more than a foot in height. The flowers which are white are produced in April. A native of the Crimea. Offsets readily grow in common garden mould. Introduced 1822. This species is the *Amaryllis caspia* of Linnaeus.

43. *ALLIUM ALBIDUM* (whitish garlick). *Scape* oblique, four-cornered; *leaves* linear; *umbel* fastigate; *stamens* simple, as long as filaments.—A native of the Crimea, nine inches high. Flowers white; flowering in July. Increased by offsets. Introduced 1820.

44. *ALLIUM SAXATILE* (strong garlick). *Scape* rounded; *leaves* half-round; spathe acuminate, longer than *umbel*; *stamens* simple, longer than flower.—This kind is also a native of the Crimea, and was introduced into our gardens in 1823. Its flowers, which are white, are produced in July and August. Increases readily by offsets.

45. *ALLIUM COWANI* (Cowan's or Peruvian garlick). *Bot. reg. 758.* *Scape* half-rounded; *leaves* lanceolate, acuminate, flaccid, ciliated, sheathing; *umbel* fastigate; *sepals* obtuse.—Root bulbous: leaves at the surface of the ground shorter than the scape, which is naked, half round, and smooth: spathe of the umbel split on one side, ovate, pointed, shorter than the flower-stalks.

Although several species of the same genus had been discovered in north America, some of which are said to be identical with those of Europe or Asia, none had been known to be natives of the southern part of the New World, before the arrival of this species, which was sent to the Horticultural Society from Peru, in 1823, by James Cowan,

Esq., and flowered the same Summer in a cold frame in the gardens of the society at Chiswick. It is nearly related to the common *Allium ursinum* of this country, from which it is distinguished by its leaves being ciliate, a little undulated, and much more flaccid, with quite a different outline; its petals are obtuse, not pointed.

46. *ALLIUM ACUTANGULUM* (acute-angled garlick). *Scape two-edged, angular; umbel clustered; stamens simple, as long as flower; leaves linear, oblique.* Grows to more than a foot in height. The flowers, which are of a whitish colour, are produced in June and July. Increased by cutting. Introduced 1815.

47. *ALLIUM SPIRALE* (spiral garlick). *Scape nearly two-edged; umbel capitate; stamens longer than flower; leaves linear, spiral.* A plant nine inches in height, a native of Germany, with white flowers; flowering in June and July. Increased by offsets. Introduced 1812.

48. *ALLIUM NUTANS* (nodding or flat-stalked garlick). Bot. mag. 1143. *Scape two-edged; umbel drooping before flowering, afterwards erect; leaves linear, flat; stamens three-pointed, longer than filaments. Bulb ovate, lateral; leaves all radical, several linear-lorate, (not unlike those of *Narcissus orientalis*) somewhat fleshy and rigid, especially downwards, obliquely twisted, obtuse; scape generally higher, compressed, subulately ancipital, rigid, umbel before it is extruded from the spathe, nodding, then upright, globular, heaped among the larger ones; spathe far shorter than this, unequally torn, with sometimes intermediate bractes, partially enveloping portions of the inflorescens fasciculately; corolla of a faded rose-colour, hexapetalously parted, campanulate; outer segments cymbiform-convolute, shorter; inner, ovate, flatter; filaments nearly twice as long as these, upright, alternate ones subulate, higher than the others, which are membranously dilated, for the length of their opposed segment, with a tooth-form appendage on each side, or tricuspidate, with a longer middle prong; germen depressed oblong, trilobate-trigonal; style nearly three times longer, setiform, white, terminated by an inconspicuous stigmatose point, anthers small, incumbent, brown. Every part of the plant when bruised has a very rank smell of garlick. Native of Siberia. Introduced by Dr.*

Pitcairn, about 1785: quite hardy. Blooms in June and July.

49. *ALLIUM ASCALONICUM* (Shallot). M. his. s. 4, t. 14, f. 3. *Leaves subulate; umbel globose; stamens three-pointed.* This relative of the onion was formerly called, and more properly named, Scalion, from Ascalon, a town in Syria, near the Mediterranean, from whence the Greeks first procured it. Pliny says the Ascalonian onions are proper for sauce.

Dr. Hasselquist found the shallot wild in Palestine. The root of this species of *Allium* is conglobate, consisting of many oblong roots, bound together by their membranes; it is very pungent, has a strong but not unpleasant smell, and is therefore generally preferred to the onion for making high-flavoured soups and gravies. It is also much used in pickles, particularly in the East Indies.

The shallot is considered by the epicures in beef-steaks, as the best seasoning for this English dish, and those who are too refined in palate to swallow the biting root, have their plates rubbed with this relishing plant.

It was first brought to England in the year 1548, and we may safely conjecture that it soon found its way to the breakfast table of Queen Elizabeth.

The shallot is easily propagated from the small roots or offsets, that afford us another peculiar instance of the mode which Nature has adopted in fulfilling her laws for the renewal of the species. The viviparous plants deserve more attention than has been generally given to them. The manner in which they produce their progeny, proclaims the wisdom of their Maker, in a degree not less wonderful to the curious, than mysterious to the unformed. Nor is the manner in which bulbs are multiplied less beautifully diversified than that by which oviparous plants are produced.

The shallot, being a native of a warmer country than England, requires more attention than our indigenous plants, for, if it is suffered to remain too long in the cold earth, it decays altogether. In the propagation of this plant, the smaller roots or offsets are the best; these may be planted out in Autumn or early in Spring: the end of October or beginning of November

for the Autumn planting, and February and March for that of the Spring; but not later than the beginning of April. The Spring is the usual season for planting them, but when planted in Autumn, in a light dry soil, they often grow larger, and sooner attain their full growth in the following Summer. They must be planted in beds four feet wide, in lengthwise or longitudinal rows; the beds six inches asunder. Each offset to be inserted singly, either by a dibble, or placed in drills of the depth of two or three inches, and the distance of each offset to be six inches.

They shoot up in leaves in March or April, and the roots increase in growth until July or August. Occasional hand weeding or hoeing is all the culture required. Towards the end of July or beginning of August the bulbs will have attained their full growth, which will be seen by the withering of the leaves, which tells us that the occult treasures are matured.

Then in a dry day take them up, and spread them in the sun to harden; the largest to be cleaned and preserved for use, and the smaller offsets reserved for propagation.

Shallots are sometimes required for use early in the Summer: in such cases a few may occasionally be taken up for an immediate supply.

50. *ALLIUM SENESCENS* (Narcissus-leaved onion or garlick). Bot. mag. 1150. *Scape two-edged; leaves linear, convex and smooth beneath; umbel roundish; stamens subulate.* Differs from *angulosum*, in having somewhat broader and flatter leaves of a greyish-green colour, which are also twisted spirally; the scape is neither tri-quad-rangular, striate, nor spirally twisted, as in that; the corolla does not converge triangularly nor so narrowly as in *angulosum*, nor do the stamens protrude so far. An old inhabitant of our gardens; quite hardy; and rather ornamental. Flowers in June and July. Both this and *angulosum* emit a very strong scent when bruised. A native of Siberia, Germany, Switzerland, France and Italy. Introduced 1596.

51. *ALLIUM GRACILE* (Carolina garlick). Bot. mag. 1129. *Scape rounded, very long; leaves linear, channelled; stamens subulate, connate at base. Bulb roundish tunicate; leaves all radical, ambient, recurved-recumbent,*

narrow-lorate, sub-channelled, concave, subearinate, far convolute-attenuated upwards, about half an inch broad, sometimes higher, at others lower than the *stem* which is roundish, solid, upright; *umbel* lax, few (6—12) flowered, sub-fastigiate, twice higher than the membranous, acuminate, bivalved *spathe*; *corolla* about half an inch long, whitish, turbinate-campanulate *segments*, grown together into an ob-conic brownish green *tube* for nearly one-third of their length; *laminae* obovate-lanceolate, obtuse nearly equal, with brownish-purple longitudinal carinate streaks, intersecting them on the outside; *outer* ones lightly carinate, and less obtuse than the *inner*; *filaments* equal, flat, linear, subplano-concave, mucronately pointed, adnate to the tube, nearly one-third shorter than the corolla; *anthers* small, upright, fixed by their base, at first brown; *style* even, with the stamens, white, filiform-triquetral, ending in a bluntish inconspicuous, sulphurescent stigmatose apex; *germen* of a cinereous green, shorter than style, turbinate-oblong, obsoletely trigonal, six-streaked, somewhat uneven; *capsule* turbinate-oblong, obsoletely tripulvinate, *seeds* compressedly pyriform or aciniform, black, shining, few. Native of Carolina. Remarkable for being devoid of the well-known scent, so usual in the rest of this genus. We suspect it to be the same with the *mutabile* of Michaux. Introduced about 1770 by the Duchess of Beaufort. Not very common in our collections, but hardy, and of easy culture, flowering in April and May.

52. *ALLIUM ANGULOSUM* (angular-stalked garlick). Bot. mag. 1149. *Scape two-edged; leaves linear, channelled, angular beneath; umbel fastigiate.*—There have been great doubts if this is really a distinct species from *senescens*, as well as much confusion, in the synonymy of both. We are convinced of their being specifically different, and have stated the distinguishing characters in our account of *senescens*. A perfectly hardy species of easy culture, and well known in our gardens. A native of Germany, Switzerland, and Siberia. Introduced 1739.

53. *ALLIUM STRIATUM* (streaked-leaved garlick). Bot. mag. 1035, 1524. *Scape, three-cornered, shorter than the linear-furrowed leaves; umbel fasti-*

giate; stamens simple; sepals obtuse.—*Bulb* about the size of a filbert, tunicated, white; *leaves* about seven or eight inches high, several radical, upright, stiffish, linear-lorate, attenuated upwards, bluntish, concave-channelled within, outwards convex, striatulate; *scape* about equal to these, round, compressed, naked; *spathe* bivalved, valve scarious-membranous, ovate-acuminate, about three times shorter than the umbel, which is few flowered, (6—7) lax; *pedicles* filiform, about an inch and a half long; *corolla* patent, segments lanceolate; *filaments* subulate, equal, shorter than the corolla; *style* filiform; *capsule* trigonal-turbinate; *seed* black, shining, orbicular, variously pressed. A native of Virginia. Has been known for some years among the nurserymen, but not by the true name. Blooms in May. Was probably imported by way of Holland. Not the least scent of garlick can be perceived in any part of it.

54. *ALLIUM NARCISSIFLORUM* (Narcissus-flowered garlick). Vill. Delph. 2, t. 6. *Scape rounded, longer than the linear subulate leaves; umbel fastigiate; stamens simple; sepals mucronate.*—A native of France. The stem is more than a foot in length. The flowers, which are white, are produced in July and August. Increased by offsets.

55. *ALLIUM CANADENSE* (Canadian garlick). *Scape rounded; leaves linear.*—Root perennial; leaves flat, smooth, straight, seven inches long; stem almost naked, cylindric, smooth, scarcely longer than the leaves; *spathe* ovate, pointed, sharpish. Flowers few, pedicelled, whitish; petals oval; filaments simple, the length of the corolla, with brownish-red anthers. Native of north America. Introduced 1739.

56. *ALLIUM URSINUM* (Ramsons or broad-leaved garlick). Eng. bot. 122. *Scape three-cornered; leaves lanceolate stalked; umbels fastigiate.*—This plant is but too plentiful in woods and hedges throughout most parts of England. The milk of cows that eat it became intolerably nauseous, from the well-known garlick flavour common to the whole genus, and peculiarly active in this species. Its roots consist of long fleshy fibres, at the bottom of a slender bulb, and can scarcely be eradicated when they have once taken

possession of a spot of ground. Moist shady groves and thickets are its favourite habitation, and the copious snow-white flowers enlivening many a shady dell, might be seen with pleasure, if the odour of the herb, whenever it is bruised or trodden upon, did not so frequently infect the air around.

This is one of those species of *Allium* whose leaves all arise from the root, and the only British one of that description with broad leaves. Its characters indeed cannot be mistaken. The stalk is occasionally more or less acutely triangular, at least in the upper part; spathe of two leaves; filaments all of equal breadth, and nearly equal in length. The flowers appear early in May, or in the more northern and mountainous counties somewhat later.

57. *ALLIUM TRIQUETUM* (triangular-stalked garlick). Bot. mag. 869. *Scape and leaves three-cornered; stamens simple.*—Leaves resembling those of the bur-reed, very much keeled; scape erect, shorter than the leaves; *scape* lanceolate, bivalve, umbel length of the spathe; petals lanceolate, acuminate, white, with a green keel; stamens and pistil half the length of the petals, anthers yellow; stigma acute. Native of Italy and Spain, and (according to Desfontaines) of the Algerine territory, where it grows at the hedges of fields. Flowers in May and June. Cultivated in 1768, by Mr. Miller.

58. *ALLIUM CLUSIUM* (Clusius's garlick). Clus. hist. p. 192. *Scape rounded; leaves linear, flat, ciliated; umbel few-flowered; sepals obovate concave.*—This species grows to about nine inches in height. Its white flowers are produced from June to August. A native of the south of Europe. Introduced 1803.

59. *ALLIUM MOLY* (great-yellow Moly). Bot. mag. 499. *Scape nearly cylindrical; leaves lanceolate sessile; umbel fastigiate; the three outer petals spreading, the inner ones erect.*—Of this very numerous genus there are but few species with yellow flowers; this plant was, therefore, no doubt, cultivated at first as much for its singularity as its beauty. Parkinson figures and describes it in his *Parad. terr.* as he does many others of the same tribe, in which he appears to have been very rich: he observes that when the plant comes up with a single leaf, it produces no flowers; but when it has two, it does.

The Yellow Moly has some beauty in the flowers, and deserves a place in borders where few better things will thrive.

Grows wild in Hungary, on Mount Baldo, about Montpellier, and in the Pyrenees; is a hardy perennial, growing to the height of ten or twelve inches, producing its flowers in umbels in the month of June. Introduced 1604.

For the most part it increases plentifully, both by roots and seeds; but in some situations its bulbs are liable to be greatly injured by the wire worm.

60. *ALLIUM TRICOCUM* (three-seeded garlick). *Scape half-round; leaves lanceolate, oblong, flat, smooth; umbel globose; seeds solitary*.—A native of North America; six inches in height, with white flowers, which are produced in July. Increased by offsets. Introduced in 1770, by Mr. W. Young.

61. *ALLIUM CERNUUM* (drooping garlick). Bot. mag. t. 1324. *Scape four-cornered; umbel fastigiate cernuous; leaves linear, flat; stamens subulate, longer than flower*.—Scape about a foot and half high; umbel in the specimens we saw, 30-40 flowered, loose; corolla rose-white; germen marked with three pale, yellow, vertical lines; the whole plant, when bruised, emits a very strong alliaceous scent. Roth mentions his having received the plant from Schreber, under the name of *Allium alatum*, but is ignorant of its habitat. Capsule roundish, trigonal, three-lobed, with the lobes blind, bifid, valves obcordate, bidentate, with three obovate compressed shining seeds in each capsule (cell) which are retuse at the base. Hardy and easy of culture. It flowers in July. A native of North America. Introduced 1806.

62. *ALLIUM STELLATUM* (starry flowered or Missouri garlick). Bot. mag. 1576. *Leaves twisted linear; umbel loose; filaments subulate, as long as flower*.—A plant lately introduced from America, where it is said to have been found growing on the banks of the Missouri, by Mr. Nuttall. It has many characters in common with the *Allium cernuum*; but it differs from it in being a smaller plant, bearing deep pink flowers, and having an upright umbel and filaments only equal to the corolla; whilst that has a cernuous or nodding umbel and filaments about twice the length of the corolla. When rubbed or bruised, the

odour peculiar to the genus is perceptible, but not in a high degree. We are told in the sixth edition of Don's Cat. of the Cambridge garden, that *cernuum* is also a native of America. We can hardly deem the two plants varieties of each other; but if not such, they are certainly very near akin. Introduced in 1810.

63. *ALLIUM BISULCUM* (furrowed or jonquil-leaved garlick). Redoute, Lilia. tab. 286. Bot. mag. 1831. *Scape rounded; longer than leaves; umbel compact; stamens subulate, as long as flower*.—The resemblance of the present plant to *senescens*, is so near, that we were not without suspicion of their being mere varieties. We have, however, been determined by the work above cited, in considering them as distinct. *Bisulcum* has narrow thick semi-cylindric leaves of a clear deep green colour in no way twisted. In *senescens*, these are narrow, lorate, glaucous, and twisted or oblique; in our plant the stamens are even in length with the corolla; in that they reach somewhat beyond it; here the germen is green with slightly protuberant lobes, in that it is purplish, with very strongly protuberant lobes. Blooms in June and July. Perfectly hardy and of easy culture.

64. *ALLIUM BAICALENSE* (Baical garlick). *Scape rounded at end; umbel half-globose; leaves linear, flat, channelled at base; stamens subulate, longer than filaments*.—A native of Siberia, with purple flowers. It is nine inches in height, flowering in June and July. Increased by offsets. Introduced 1816.

65. *ALLIUM RUBENS* (red-rooted garlick). *Scape rounded; umbel fastigiate; leaves half-round, compressed; stamens lanceolate, shorter than filament*.—This species is a foot in height. It produces its pale purple flowers in June and July. Increased by offsets. A native of Germany. Introduced 1805.

66. *ALLIUM FRAGRANS* (fragrant garlick). *Scape rounded; umbel few-flowered, fastigiate; leaves linear channelled; stamens lanceolate shorter than fil.* A plant eighteen inches high. The flowers, which are white, are produced in June and July. Native of the West Indies. Introduced 1822.

3. LEAVES FISTULAR.

67. *ALLIUM ACUTUM* (acute garlick). *Scape leafy; umbel fastigiate; spathes*

nearly equal; *sepals mucronate*.—In this plant, which is a foot in height, the flowers are of a pale purple. Flowers in July. Introduced 1819.

68. *ALLIUM FOLIOSUM* (leafy garlick). Redout. lil. 4. t. 214. *Scape leafy at base*.—The flowers in this plant are of a purple colour; they are produced in July. It may be increased by offsets planted in common garden mould. Introduced 1817.

69. *ALLIUM PROLIFERUM* (tree onion). Bot. mag. 1469. *Scape fistular twisted; umbel bulbiferous proliferous; stamens three pointed*.—The present species, in all our gardens, and some of our books has been mistaken for the *canadense*; a species than which no one of the same genus can well be more distinct from another; that having flat leaves, a slender uninflated stem, uniform simple stamens, and bulbs more like those of the garlick than the onion. *This is an usual plant in our gardens; that we have met in no one*. It deserves to be cultivated both as a curiosity in producing the onion at the top of the stalk, and for the use of the onions, especially for pickling. They are excellent when pickled, and superior in flavour to the common onion. This kind is perennial, and is propagated by planting the bulbs in Spring or Autumn; either the root bulbs, or those produced on the top of the stalk, being planted in beds of good earth, in rows at two feet distance from each other, and two or three inches deep. They shoot up leaves and stalks in the Spring and Summer, and produce the bulbs for use in July or August. The root bulb remaining furnishes a production of top-bulbs annually in that season. The root-bulb increasing by offsets may be occasionally taken up in Autumn or once in two or three years, for the purpose of separating the offsets, and re-planting them when necessary.

70. *ALLIUM OCHROLEUCUM* (pale-yellow garlick). Pl. rar. hu. 2. t. 186. *Scape rounded with an angle; leaves linear, obtuse; umbel rounded; stamens setaceous, twice as long as filaments; capsule triangular, three-celled; seed triangular, oblong, black*.—A native of Hungary. The flowers of a pale yellow colour, very slightly tinged with green, are produced in August. Introduced 1816.

71. *ALLIUM CEPA* (common onion).

Scape ventricose beneath, longer than the round leaves.—In Latin it was named *Cepa* and *Cepe*, from *Caput*, as is supposed from the largeness of the head. It was also called *Unio*, being a single root without offsets, which most other bulbs have; and from this word, the English name appears to have been derived.

The common onion *Cepa*, owes its chief qualities to cultivation. Pliny, who mentions all the countries from whence the Greeks as well as the Romans, procured different varieties of this root, says he could not discover that they ever grew wild.

There is no plant that has been so subject to the caprice of fashion, and the disputes of physicians as the onion. It has been the common seasoning for meats, with most nations, from the earliest time to the present, from the table of the king to that of the peasant.

It was one of the Egyptian divinities, who used to swear by the onion, solemnly calling it to witness their oath as a god.

Among the complaints which the Israelites made to Moses, when in the wilderness, was that of being deprived of leeks, onions, and garlick, of which, said the murmurers, "we remember we did eat in Egypt freely."

A friend, who has travelled in that country, says, we should not condemn these sons of Abraham, if we knew how much superior and sweeter the onions of Egypt are when compared with those of Europe.

Theophrastus, who died in his 107th year, complaining of the shortness of life, wrote on the onion about 260 years before the birth of Christ; and Palladius, a Greek physician, who also wrote on this acrid root, recommends it to be sown with savory. Pliny follows the same opinion, and says, "onions prosper when savory is sown with them." It appears to have been a study with the ancients to find what plants thrived well together, or according to their belief, what herbs had a sympathy with, or antipathy to, each other.

We find that all the plants which they recommend to be sown or planted together, are of very opposite natures, and there may be more reason in the system pursued by the ancients than is generally allowed; for plants drawing the same juice from the earth must

naturally weaken each other ; whereas those requiring different nutriment may in some degree assist each other, each feeding on juice that are prejudicial to plants of the other species. Our husbandmen acknowledge the principle by changing their crops. Lord Bacon carried this opinion so far as to say "the rose will be sweeter if planted in a bed of onions."

Gerard says, "The onion being eaten, yea, though it be boiled, causeth head-ache, hurteth the eies, and maketh the mandimsighted; dulleth the senses, engendereth windiness, and provoketh overmuch sleepe, especially being eaten rawe." He adds, "being rawe, they nourish not at all, and but a little though they be boiled."

Dean Swift says,—

"This is every cook's opinion,
No savoury dish without an onion.
But lest your kissing should be spoild
Your onions must be thoroughly boild."

Their property of drawing tears has been noticed by our immortal bard.

"If the boy have not a woman's gift
To rain a shower of commanded tears.
An onion will do well."

We learn from Bradley, who wrote in 1718, how much this vegetable was then esteemed. After having stated that the potatoe was thought a root of little note, he says, "I now come to treat of the onion, a root more generally used in the kitchen than any other. Of this there are two kinds worth the gardener's care; the first is the Spanish onion, which affords a large sweet-tasted root, and the other the Strasburg onion, which is more biting, and lasts good much longer than the former."

The many domestic purposes to which this strong-scented vegetable is applied at the present time are known to every one: its nature is to attenuate thick viscid juices, consequently a plentiful use of it in cold phlegmatic constitutions must prove beneficial. Many people shun onions on account of the strong disagreeable smell they communicate to the breath; this may be remedied by eating walnuts, or a few raw parsley-leaves immediately after, which will effectually overcome the scent, and cause them to sit easier on the stomach.

METHOD OF PROPAGATION AND CULTURE IN THE ONION KIND.—*Common Onion.*—Among the several varieties of

the common onion, the Strasburgh is the best for general culture, having a handsome bulb, mostly assuming a roundish oval shape. It is of firm growth, and generally keeps well for winter use. The Spanish onions are large and flat; the first sort is, however, of the mildest flavor; but all the varieties for the most part afford profitable crops, and none excel them for culinary purposes; but they seldom keep so well after Christmas as the Strasburg or oval sort of onion. The Portugal onion is a very large handsome bulb, of a roundish oval shape, though it rarely attains the size here, as in that climate, as is obvious from those annually imported from that kingdom. If, however, seeds saved in Portugal be sown here, the bulbs will arrive at a much larger size than from such as are saved in this country, especially where preserved two or three years successively, in which cases they are often so far degenerated, that the bulbs become flat, and not larger than the common onions. The mode of transplanting them at an early period, which is adopted in that country, may also have much effect in rendering the bulbs so large. From this sort of onion being very mild, it is much esteemed for sauces and other culinary uses.

All these kinds are propagated by seed sown annually; which for the general crop should always be performed from about the twentieth of February until the latter end of March, though in cold wet stiff soils it may be proper to defer sowing entirely until towards the middle of the latter of these months. But in cases of omission in sowing at the times above recommended, it may be performed with tolerable success in the beginning or any time before the fifteenth of April, but the crops of the February or March sowing always bulb more freely and acquire a much larger growth than those sown at later periods.

The most proper situation for crops of this kind is an open exposure, and where the soil is moderately light and rich in vegetable matter. Thus spots of the best mellow ground in the garden should always be chosen, with the addition, if possible, of a good coat of well rotten dung, dug well in, but not too deep, the surface being kept level, and while it is fresh stirred, well raked, and the seed sown, a point which is of im-

portance to be attended to. The sowing when the surface is so wet or moist as to clog to the feet or rake in preparing it, should not however be performed.

The proper quantity of seed is in general about an ounce to every rod or pole of ground; but where it is not required to have them thick for cuttings, two ounces for three rods may be sufficient. Great care should be taken to procure fresh seed, as but very little of that which is kept more than one year will vegetate.

The seed may either be sown over the whole of the piece or plot of ground, or it may first be divided into beds of four or five feet in width, allowing foot-wide alleys between them. In sowing, the seed should be put in with a regular spreading cast, and the surface, when very light, immediately trodden over evenly upon the seed; afterwards, where sown in beds, the alleys may be pared an inch or two deep and the earth cast over them, proceeding directly to rake in the seed regularly with an even hand, trimming off all the stones, roots, &c. See Sowing Seeds.

The method of sowing them in beds is the most eligible, where it is designed to draw or cull the young onions from time to time for market or family use; as, in such cases, a person can stand in the alleys without treading upon the beds, which not only renders the surface hard, so as to injure the crop, but highly destructive, by trampling upon the plants themselves. It is likewise very convenient to stand in the alleys, in order to weed, thin, or hoe the crop as occasion may require. Although it is a common practice in the general culture of onions to sow them thick, in order to allow for culling or drawing out the superabundant plants, by degrees as they are wanted; it would no doubt be a better mode to sow a piece particularly for general culling, exclusive of the main crop; because by daily thinning out the superfluous plants there is no avoiding treading upon, disturbing, and loosening the remaining ones, by which they become stunted in their growth, and by no means so fine. There is also another very common but injudicious practice, which is that of mixing other crops, such as leek, lettuce, radish, carrot, &c. with these crops. It is productive of confusion, as well as obstruction to the chief crop, without

producing any great advantage; nothing should therefore be admitted, except a very thin sprinkling of cress lettuce in some cases. In about fifteen or twenty days after the seeds is sown the plants generally appear, and in a month or six weeks after that, as in May and the beginning of June, they will be three or four inches high; when they should be well cleaned from weeds, and the main crop thinned to three or four inches distance. The weeding and thinning should be begun in due time, before the weeds branch and spread much, which may either be performed by the hand or small hoeing; the latter is the most expeditious method, as by it one man may do as much as three, and it is also the most beneficial to the plants; as by stirring the ground about them with the hoe, it greatly forwards their growth, as is mostly seen in a few days after the operation. This mode, however, is more particularly eligible for the larger principal crops, for which a good sharp one-hand hoe, about two inches, or not more than two and a half broad, is the best, taking the opportunity of dry weather for performing the business and carefully cutting up all weeds. Where the onions stand too close they should be cut out in a regular thinning order to about three inches distance: or in such crops as are not wanted for occasional cutting, they may be hoed out at once to about four or five inches, having regard to leave the strongest plants, as much as possible, for the continuing crops.

In the course of two or three weeks or something more, it will generally be proper to run over them again in the same manner, in order to cut up all advancing weeds, and any superabundant plants that may have escaped in the first hoeing; after this they seldom require any further culture, than that of pulling out such casual straggling weeds as may rise.

But where the crops are small, or where they are required for thinning or culling by degrees, for use in their young green state and in small bulbs, the weeding and requisite thinning where they are in clusters, may generally be best performed by the hand. In the advanced growth of the crop, when the superabundant plants are occasionally thinned out for use, as wanted, they

should be drawn somewhat regular, so as to leave a sufficiency of the strongest plants remaining at moderate distances for a full crop to attain their full growth in large bulbs.

It is highly necessary to continue to keep the different crops very clear from hurtful weeds in their advancing growth during the months of May, June, and July, which being their principal growing seasons, if they are not kept free from weeds, and sufficiently thinned to proper distances in due time, they draw one another up, weak and slender, which much retards their bulbing. About the middle or latter end of June the continuing crops begin swelling a little at bottom in their bulbing order, but more fully in July; and in August the bulbs arrive to full growth, and are proper for taking wholly up. Towards the middle of August the crops in general should therefore be examined, and when the necks shrink and fall, and the leaves wither, it may be concluded that the bulbs are arrived at maturity, and have done growing.

They should then be pulled up, cleaned, dried, and housed for use; this being best done in dry weather on a piece of the ground hoed, raked and cleaned, in order to spread them on as they are pulled up, to dry and harden. They should lie in this way a week or a fortnight, being turned every day or two, when, if the weather proves dry, they will be duly prepared for keeping; the first opportunity should then be taken to house them. The bulbs must be first divested of all adhering earth, loose skins, and the grossest parts of the leaves and neck, rejecting all infectious and bruised ones, and then they may be carried into any dry upper room, out of the damp, spreading them on the floor as thinly as convenient. The closer the room is kept the better, but care must be taken to turn them over once in three weeks, and to clear out such as have any tendency to infection.

As in the culture of onions it frequently happens, that through badness of seed many are disappointed of a crop, by waiting in expectation of the plants rising till it has been too late to sow again; in such cases recourse may be had to transplantation from other gardens, as a neighbouring one, where there are superfluous crops, or a bed

or such part of one as is necessary may be purchased from a market gardener. This business should be done in May or early in June, and if possible in moist weather, having a spot of well-dunged ground prepared, take up the plants with good roots, and plant them in rows six inches distant, and four inches asunder in each row, inserting the roots but moderately into the ground, for if planted too deep, they do not bulb well; giving them a good watering as soon as transplanted. By repeating the waterings occasionally for a week or fortnight, the plants will generally grow freely, and form tolerably handsome bulbs.

Onions for pickling are in great request in many places; such as are proper for this purpose should not be bigger than common round buttons, therefore in order to procure them in due quantity, some seed should be sown late, in a spot of light poor land; about the middle of April is probably the best time. It should be sown moderately thick, the plants requiring little thinning, except where they rise in very thick clusters. They bulb in June and July, and are generally fit to take up in August. In the Spring many of the keeping onions will unavoidably grow as they lie in the house; these may be planted out in rows, at six inches distance, and will serve to draw by way of escallions.

The Autumn or Michaelmas crop, is generally sown in August, and the plants rise before Michaelmas, stand the Winter, some to be drawn occasionally for use in that season, but principally intended for Spring use, to be drawn up young for salads, &c., and likewise where the Strasburgh or any other variety of the common onion are sown, they, if permitted to stand, bulb to a tolerable size in June, and supply the kitchen or market as headed onions, till those of the Spring crop are bulbed.

But as the common onion is liable to be cut off in severe winters, it is always necessary to sow at the same time some beds of Welsh onions, which bid defiance to the most rigorous Winter frosts. August is the best season for sowing these crops, for if sown sooner they are not only apt to get too forward in growth before Winter, but to run up for seed earlier in the Spring; and therefore the

proper time to sow the main crop is the first or second week of that month, or in the third week for a late standing one, sowing them in beds four feet wide, with twelve inch alleys between; sow and rake in the seed as directed in the Spring crop, only let a much larger quantity be sown in this case. The plants generally appear in a fortnight, and numerous weeds, to which early attention must be had to clear them out by hand before they begin to spread; but the plants of this crop are not now to be thinned. But in November and December, if they stand very thick, some of the largest may be occasionally thinned out for various uses.

Saving Seed. February is the proper time to plant onions in this view, though this is often done in October by those that save great quantities for sale. For this purpose, make choice of a due quantity of the largest and handsomest bulbs, rejecting all blemished ones, and such as have already made any effort to grow, and having made choice of a spot of ground well exposed to the sun, which being dug, proceed to plant the onions; strain a line, and with a hoe or spade open three drills, twelve inches asunder, and six deep, place the bulbs therein nine inches distant, and rake the earth over them; measure off two feet for an alley, and plant three more rows as above, and in that manner proceed to the end; the wide space of two feet is by way of alley to go between, to hoe and clear off weeds as well as to stake and support the stalks of the plants when necessary. In June the flower-stalks will be shot to their full height, and the flower heads will be formed at top, to secure which, in erect position, drive some stout stakes in the ground along each row, at two yards distance, and from stake to stake fasten double lines of pack-thread; and if these are tied together in the interval, between the stems of the plants, it will effectually secure them. About the latter end of August the seed will be ripe, which is known by the capsules opening, and the black colour of the seed; the heads should be cut in a dry day, and spread upon cloths in the sun, care being taken to remove them under cover in case of wet and at night; and when perfectly dry, beat or rub out the seed; cleaning it from the rubbish, and putting it up in bags for use.

As it is of the utmost importance to have good fresh seed, some to try its goodness, before they venture their general crop, sow a little in a pot, and place it in a moderate hot-bed or near a fire; a more expeditious method however is to tie about a thimble full of the seed, loosely in a piece of linen rag, and put it into a vessel of hot water, suspended by a thread; in ten to fifteen or twenty minutes pull it out, and if the seeds are good, they will, in that time, have germinated or sprouted, perhaps to the extent of a quarter of an inch in length.

Method of preserving onions from the grub.—Mr. E. Hildyard, gardener to Sir Thomas Frankland, at Thirkleby, in Yorkshire, has stated, in a communication to the Horticultural Society, that having continually lost his crop of onions, in consequence of their being attacked by the grub when half grown, he had tried the effect of trenching his beds, and this had destroyed or removed his enemy. The soil of the garden being very strong, he trenched it in winter, digging in manure at the same time, and left it exposed to the frost in a rough state till the time of sowing. It was then raked without digging, and the onion seed was sown in drills, at eight inches apart. He thins the plants and stirs the ground three or four inches deep, twice or thrice during their growth. The crops obtained by this practice are not only uninjured, but of superior size, and never fail. Mr. H. finds the plan answers equally well for garlick and shallots; the latter he always plants in preference in November; they then grow larger, and are more productive.

He sows his onions in the middle of February, if the ground be in a fit state to work properly, for the earliest sown onions are always the largest.

Charcoal Dust is recommended in a communication to the Horticultural Society, as a top-dressing for onions, and as a cure for the clubbing in cabbages.

The charcoal-dust should be the refuse of a charcoal pit. It must be spread upon the ground about half an inch thick, before the sowing of the seed, and merely skiffled in with the point of a spade, so as to mix the top soil and charcoal-dust together. Six years experience have proved that it is

a remedy for the grub and mouldiness in onions; and it has been repeatedly known to prevent clubbing in the roots of cabbages and cauliflowers.

In a communication to the Caledonian H. S., Mr. Wallace, gardener, Ballechin, observes:—"The soil of the garden at Ballechin was light, and the ground destined for onions were always dug twice a year, viz. in Autumn and Spring; giving a good coating of dung in September, and a light one in March, immediately before sowing. The crop of onions was poor, and much infested with maggot, and got worse and worse every year. To try the effect of a change of system, the ground was only hoed and raked in Autumn, and dug half-spade deep, applying well rotted cow-dung in Spring, before sowing the seed. The crop was excellent, and entirely free from the maggot." -

The reason assigned for this favourable result deserves attention, as a principle in the management of light soils.

"I find light and dry soils are rather hurt than benefitted by too much labour and pulverising the ground; and I was led at first to adopt this method, from observing that such of the tenants in my neighbourhood as gave repeated ploughings to their bare lands had seldom but a very poor crop after it."

Mr. J. Smith, gardener to James Hammond, Esq., at Potter's Bar, near Barnet, in a communication to the H. S. gives "directions for forcing onions to produce bulbs in clusters at an early season. He sows the seed in April, thickly in a bed, and does not afterwards thin the plants which come up; this causes them to remain small; a part of them are used for pickling, and the remainder, being about the size of walnuts, are planted in January or February, pressing each onion into the earth so deep as just to cover it. As soon as the seed-stalks appear, he breaks them off, and instead of making any effort to form new ones, the onions begin to form young bulbs round the old ones. By this process onions may be obtained, two or three inches in circumference, fit for the kitchen early in Spring, at a time when Spring-sown onions are not larger than quills. Onions thus thrown into clusters will be full-grown by the end of June, and fit to take up then, but they do not keep well."

Onions are preserved from the maggot and rot by watering the beds with lime water to that degree that the lime may lay one-eighth part of an inch upon the beds.

Weight of onions. December 5, 1827. Was exhibited at the Horticultural Society, four round Tripoli onions, grown by Mr. Barker, of Edmonton, that weighed 7½ lbs.

One grown in the garden of Mr. Morgan, of Oswestry, was drawn last week, (October 1, 1831) measuring upwards of 19 inches in circumference, and weighing 3 lbs. 1 oz.

An onion weighing 1 lb. 5 oz. and measuring 16½ inches in circumference, was lately (October 5, 1831) pulled by Mr. W. Ramsay, at Chancelot, near Edinburgh.

To prevent the sprouting or germinating of store onions during the Winter and Spring.—Apply a heated iron for a few seconds to the nozole of the onion, whence the roots protrude. This is found by experience to be an efficient mode of preserving them.

QUALITIES.—*The sensible, as well as chemical qualities* of the onion, resembles those of garlick; but are much weaker. On distillation it yields a small portion of acrid volatile essential oil, combined with sulphur; and the recent juice contains sugar, mucus, phosphoric acid, phosphate of lime, and citrate of lime.

MEDICAL PROPERTIES AND USES.—The onion is chiefly cultivated for culinary purposes. The root affords a considerable proportion of alimentary matter, principally mucilage, particularly when boiled; but in dyspeptic habits it occasions flatulence, thirst, and head-ache. The root is the most active part, and is stimulant, diuretic, and expectorent. On account of the free phosphoric acid it contains, the juice is supposed to be useful in calculous cases, as it dissolves phosphate of lime out of the body. Onions are, however, scarcely ever employed, except externally, as suppurative cataplasms; for which purpose they are generally roasted, split, and applied to tumours.

72. *ALLIUM FISTULOSUM* (Welsh-*Onion*). Bot. mag. 1230. *Scape as long as the round ventricose leaves.*—The only, as yet ascertained, native sources of this vegetable (known in our gardens

from the days of Parkinson) are Siberia, and certain deserts of both Asiatic and European Russia. But whence it has obtained the name of "Welsh Onion," we can form no conjecture. By the Russians it is called "Rock Onion, or Stoneleek," and is a very favourite article of food with them. In this country, it seldom finds a place among our culinary vegetables; but it is sometimes mixed with other food given to young poultry. The bulb is small in proportion to the rest of the plant; the smell and taste very powerful.

This perennial plant, therefore, deserves to be cultivated only to be drawn as young green onions for sallad, &c. in Spring; but on account of its strong taste, it is greatly inferior to the common onion.

They are so hardy as to survive the severest winter, for although the blades be cut off, the roots remain sound, and shoot forth with great vigour early in Spring, furnishing supplies until May, when they generally run to seed. This hardness renders them suitable for cultivation, as a winter-standing crop for spring use.

They are perennial in root, which increases by offsets into great clusters; but for large crops by seed. The best season for sowing which is in August, after the manner of the Autumn onion crops.

The plants appear in twelve or fifteen days, and towards Michaelmas should be carefully weeded by the hand. It is a peculiarity in this species of onion to lose their tops in November or December, and remain divested thereof till towards Candlemas, when the roots shoot forth again. It is then proper that the alleys should be dug, and about an inch of earth spread smoothly over the surface of the beds, by which means the roots become vigorous, and the plant rise strong, and the part of the onion within the earth bleached white, and rendered more tender, and they become milder and more agreeable.

When not sown at Michaelmas, the end of January or beginning of February, is a proper time. The plants will then grow sufficiently to be drawn in the Spring. Some plants should be left for stools to produce seed. At the end of March, a number of young plants may be transplanted at the distance of nine inches, which will produce seed in August. If the roots are permitted

to remain in the following years, they will produce treble the quantity; but as they increase into great bunches; it is better to remove and separate the stools every second or third year.

73. ALLIUM SCHÖNOPRASUM (Chives). Eng. bot. 24—41. *Scape as long as the round subulate leaves.*—The roots consist of slender, pale, upright, tufted, perennial bulbs; leaves three or four, radical, slightly spreading, tubular, cylindrical, taper-pointed, rather glaucous, sheathing the stalk with their dilated bases. Stalk solitary, about a foot high, being nearly the height of the leaves, cylindrical, smooth. Spathe of two ovate leaves, shorter than the umbel, which is dense, formed of many purplish rose-coloured flowers, whose stamens are all simple.

This vegetable, which partakes of the flavour both of the onion and the leek, is a native of Britain, and has been thought by some persons to be a wild onion; but we have no instance of its nature being changed by cultivation.

Chives, being once planted, continue for many years without suffering from the extremest cold of the winter.

The principal use of chives is for soups and spring salads, when young onions are not procured; the leaves, which are like short rushes, rising very early in Spring, they are often eaten with bread and butter by country people.

The method of gathering, is to cut the leaves off near the ground, by which a fresh supply is soon produced from the bottom; or occasionally the plants in clusters may be slipped quite to the root in separate little plants, resembling young onions, and used as substitute for them.

It is easily increased by dividing the roots in Spring, and planting eight or ten of them together in holes at six inches distance, in this way by Autumn, they will multiply into bunches of a large size.

Chives have nearly the same quality as the other species of leeks and onions.

74. ALLIUM SIBIRICUM (Siberian or larger Chives). Bot. mag. 1141. *Scape not quite naked round; leaves half round; stamens subulate; sepals lanceolate, acute.*—This species is used in salads and for other culinary purposes. The leaves are a little channelled, by no means angular; scape longer than the leaves; umbel level-topped; sheath small,

ovate, scariose; stigmas simple. A native of France, Sweden, Denmark, Russia, Siberia and Tartary. Introduced 1777.

75. *ALLIUM SETACEUM* (bristly garlic). Wald and Kit, t. 68. *Bulb ovate, oblong, oblique, simple; roots slender, white; scape round; leaves 4-5, setaceous, subulate; rather longer than the scape; umbel 6-10 flowered, (in cultivated plants, 20-30 flowered;) sepals ovate at ends; filaments subulate, shorter than the corolla, style shorter than the stamina; stigma acute; germen ovate; capsule three-valved, three-celled; seeds black, triangular.*—This species, which has a very unpleasant smell, is a native of Hungary. It is nine inches in height, with green and white flowers. They are produced in July and August. Introduced 1806.

76 *ALLIUM CHAME MOLY* (dwarf Moly). Bot. Mag. 1203. *Scape scarcely any, Capsules cernuous, Leaves flat, ciliated.*—Bulb about the size of a hazel nut, sometimes covered with a soft membranous coat, at others by a brown crustaceous shell; *leaves* radical, of a dark green, faced broadways to each other in pairs of unequal lengths, scape about an inch and half high, almost wholly within the ground, and sheathed by the cowed-convolute bases of the leaves; *umbel* nearly on a level with the ground, as in *Massonia*, *corolla* white, suffused on the outside sometimes with green, at others with a purple tinge; *pedicles* about half an inch long, somewhat thickened upwards; *anthers* yellow; *germen* green, vertically striped by six pale yellowish fillets; *style* about the length of this, somewhat thicker than the filaments, upright; *capsule* globular, even, about the size of a pea; *seeds* many, black angular. Flowers from January to March. It seems to be without smell. Found in the neighbourhood of Tunis, Seville, Naples and Rome, likewise in Corsica. Nearly allied to *Allium subhirsutum*, introduced 1774.

ALLOMORPHA (from *allos*, various, and *morphe*, form; habits in different situations).

Class 8. I. Octandria Monogynia.

Nat. Ord. *Melastomaceæ*.

The Characters are—*Tube of Calyx oblong, adhering to the ovary at the base; limb four-toothed; petals 4; stamina 8; anthers linear acute emargi-*

nate at the base; fruit dry, ovate-oblong, four-celled.

ALLOMORPHA EXIGUA (small *Allomorpha*) *Melastome exiguum* Jack in Lin-trans. 14. p. 10.—An erect branched shrub, a foot in height, with brownish bark and four-sided branches, sparingly sprinkled with rusty down; *leaves* large, opposite, long-petioled, ovate, acuminate, acute at the base, almost entire, smooth, five-nerved, with strong transverse reticulated veins; *petioles* long, channelled above, smooth; *stipules* none; *panicles* terminal, erect, small, with opposite divaricate ramifications; *flowers* small and inconspicuous; *calyx* inferior, tubular, connected with the base of the ovary by eight septa, limb erect, four-toothed; *petals* four, small, white, with a tinge of red, ovate acute; *stamina* eight, nearly erect, the alternate ones a little shorter; *anthers* purple, erect, linear, acute, emarginate at the base (neither curved, rostrate, nor appendiculate); *style* ascending, as long as the stamina; *stigma* simple; *fruit* small, dry, ovate-oblong, four-celled, many-seeded, the placentæ from the axis.

This species is remarkable by its very small flowers disposed in a divaricate open panicle, and the comparatively large size of its leaves. The fruit might probably be considered a capsule, as it appears to be destitute of pulp. A native of Pulo-Penang.

A mixture of loam, peat and sand suits it best; and young cuttings root readily, if planted in pots filled with peat, and placed in heat, with a hand-glass over them.

ALLUVIAL LIMESTONE, in agriculture, a sort of soft limestone found in many districts, supposed to have been formed in the early ages of the world by the disposition of calcareous matter held in the state of solution in water. This kind of limestone is supposed by Dr. Darwin, in his *Philosophy of Agriculture*, to contain magnesia, which it probably may have acquired from the sea-water in which it was originally dissolved. Such limestone as contains magnesia has been found, by the experiments of Mr. Tennant, to be much less useful when burnt into lime, for the purposes of agriculture, than such as is purely of the calcareous kind.

ALLUVIAL DEPOSITS.—The Rev. Jas. Yates in a paper on this subject read

before the Geological Society, after advert- ing to the importance of this branch of Geology to the successful study of all the more antient sedimentary deposits, and to the explanation of the methods by which bare rocks are converted into productive soils, describes some of the processes which regulate the production of Alluvium and the principal forms which it assumes.

I.—He considers first those processes of disintegration, not dependant upon the action of running water, by which materials are supplied for the formation of Alluvium. These are of two kinds.

1. Earthquakes and land slips by which large masses are detached suddenly from the mountains and fall occasionally with so great an impetus as to extend across valleys. 2. Other processes, such as frost and oxidation, which are far more important in their effects. The agents of this class always divide rocks according to their natural structure of separation, so that every fragment of the debris is bounded by the plane of its cleavage. The fragments as they fall, produce two principal forms, the lengthened talus, which in general covers the base of all calcaceous, and conglomerate, or sedimentary rocks, and the acute cone, which is discharged from the ravines of highly inclined schistose rocks, having a cleavage which meets the planes of stratification at an acute angle.

II.—The materials thus furnished are distributed by streams, which round off their angles by continual friction, so as to convert them into pebbles, sand, and mud. The hard and heavy fragments driven along by streams, also wear down the rocks in place, the latter being acted upon, according to their degrees of softness, and their proneness to disintegration.

When the detritus thus produced is discharged from a lateral into a principal ravine, or valley, the divergence of the stream gives it the form of a cone; but as the force of running water carries loose materials, much further than they would fall by their own weight, the form thus produced is not an acute but an obtuse cone. In the Alps some of these obtuse cones attain 500 feet in height, and three miles in diameter, bearing upon their surfaces, forests and villages.

The quantity of solid materials descending over the apex of an obtuse cone, is sometimes so great as to stop up the valley. The waters of the principal stream then accumulate above the obstruction, and after the subsidence of the lateral streams tear away the base of the encroaching cone. This form the Author designates as the obtuse cone clipt at the base.

Narrow valleys and plains are frequently divided by transverse ledges of gravel. The formation of these is attributed to the operation of rivers, which it is supposed had first accumulated their detritus in dams, and that these dams, having been successively broken down after the subsidence of floods, were re-produced upon a rise of the streams,

Numerous causes are assigned as conspiring to vary the depth of streams.

These causes are rains; the melting of Alpine snows and glaciers; the breaking up of ice in rivers; and the bursting of lakes.

III.—Whenever detritus is conveyed by running into standing water, a separation takes place between those finer particles which are held in suspension, and those which it only rolls along the bottom.

As the debris of horizontally stratified rocks forms a lengthened talus at their base, so the loose and heavy materials washed down the side of a mountain, and conveyed into a lake, as soon as they reach its margin fall into a steep slope of the same description.

Layer after layer is thus deposited, the result of which is, that a terrace is gradually formed, dipping under the surface of the lake with a gentle slope, and then abruptly terminating in a deep declivity.

The Author next endeavours to show, that what is commonly called a Delta, is more strictly speaking the Sector of a circle.

After describing numerous examples of forms of alluvial matter, in artificial reservoirs and in lakes, the author alludes to the probable existence of similar deposits upon a vast scale in the deep and still waters of the ocean; and considering the English, St. George's, and Bristol Channels, to be of the nature of Estuaries, he observes that the arc of the Sector is found encircling the south-

western extremity of Ireland on the one hand, and the north-western angle of France on the other, and coinciding with a line along which the water deepens suddenly from one to another more than two hundred French fathoms.

It is then shown that lakes are filled up, not by depositions in their deep, central waters, but by the gradual advance of all their lateral terraces and cones.

IV.—When two streams meet, they neutralize each other's motion, and a deposition takes place at the point of quiescence.

Peculiar appearances ensue when streams meet at different levels. If a lateral stream brings down a disproportionate quantity of detritus, its bed is raised, but is abruptly terminated by the action of the principal stream. Hence the valleys of mountainous regions exhibit not only level terraces formed in lakes, but others the edge of which have a steep declivity.

Finally, the Author presumes that the forms which alluvium puts on in rivers are produced also in seas, and in the ocean, by the opposition and union of currents flowing either at the same or at different levels.

ALNUS (From the Celtic word *al*, near, and *lan*, the edge of a river, in reference to the place where the species grow).

Class 21, 3. Monoœcia Triandra.

Nat. Ord. *Amentacea*.

The characters are—*Flowers collected into imbricated catkins; barren flowers; scale of the catkin three-lobed, with three flowers; perianth single, four-partite; fertile flowers; scale of the catkin subtended, with two flowers; perianth 0, Styles 2; fruit compressed.*

1. ALNUS GLUTINOSA (common Alder). Eng. Bot. 1508. *Leaves roundish; cuneiform, obtuse, lobed at margin and serrated, somewhat glutinous, downy in axils of veins beneath, pericarp a compressed two-celled nut, covered with a bony hard shell; in each cell a smooth, pale-coloured, lens-shaped, rounded seed obliquely acuminate on the outside at apex.*

The common Alder appears generally as a shrub, it will however grow to a considerable tree, 35 or 40 feet in height.

The Alder and its relatives that love the stream, follow the current through every part of the globe; confining the rivers to their due bounds, and correct-

ing the vitiated air of those situations by the peculiar qualities allotted to aquatic trees, which absorb the corrupted air more profusely than the natives of drier situations.

In this country the alder is seldom suffered to attain its natural bulk, but in ancient times, when men were less numerous, and trees more abundant, the dimensions of the alder were sufficient to form their boats, and, if we except Noah's Ark, we shall find that the first vessels we read of were made from these trees. Their contiguity to rivers, and the imperishable nature of the wood, when kept in the water, were no doubt their recommendations to the early navigators. As men dispersed themselves over Europe, so did they convey the nautical use of this tree; and it is singular, how little the pronunciation of its name has changed with the migrations of man. The oldest English writer we have consulted calls it Alder, from which it was changed to Aller, and again to Alder; the Scots call it *Eller*; the French *Alune*; the Germans *Eller*, *Erle*, or *Erlenbaum*; the Dutch *Els*, *Elzeboom*; the Danes *E'l*, *Elle*, *Elletie*; the Swedes *Al*, *Ahl*; the Italians *Alno*, *Ontano*; the Spaniards *Aliso*, *Alamo*; the Portuguese *Alemo*; the Russians *Olcha*; the Polanders *Oloza*; and the Latins *Alnus* and *Alnos*, which is thought to be abridged from *alors amne*: "I am nourished by the stream."

The Alder does not possess those striking beauties which attract our admiration to many other trees or shrubs; nor is it calculated to fill a space in those shrubberies whose narrow bounds are limited to the width of the dwelling, and whose length is terminated by the useful abode of the *horse and chaise*. The Alder must terminate the largest shrubbery and most lengthened walk; it should point out the river's approach, and direct the angler where to

"Throw nice judging the delusive fly."

The round dark leaves of the Alder may be associated with the long lanceolate and silver-tinted foliage of the *Salix alba* or white willow, and where the stream widens into a pool, the softer tints of the weeping willow may lend its aid, and "Po's tall poplar" may be employed to break the line.

The Alder is what Botanists denominate an androgynous plant, that is producing both male and female flowers

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separately, but on the same tree. The catkins or male blossoms are formed about the middle of September, where they hang uninjured by tempestuous rains, and unsexed by flattering sunbeams, until their betrothed female flowers appear in March, when

“The happy trees
Commit their mutual wishes to the breeze;
The palm invites the palm to Hymen's vows;
Swung in the wind, the poplars nod in love;
Alders to alders bend their longing boughs;
And, through the leaves love whispers in the grove.”

The Alder is one of the most proper and profitable trees that can be employed to keep up the embankments of rivers or canals; for whilst its roots and trunks are acting as a buttress against the power of the stream, they send out branches which may be cut for poles every fifth or sixth year, particularly if they be pruned of their superfluous shoots in the spring.

“As Alders in the spring, their boles extend,
And heave so fiercely, that the bark they rend.”

Virgil.

It is no small recommendation to these trees, that their branches do not injure the growth of grass, whilst their appearance adds more to the beauty of brook-lands than most other aquatic trees. The wood of the alder makes excellent charcoal, and it is valuable for pumps, pipes, sluices, and all works intended to be constantly under water. It also serves for many useful purposes in domestic and rural economy, such as cart-wheels, troughs, handles of tools, &c., whilst the good housewife knows its value in spinning-wheels, milk-vessels, bowls, trenchers, &c., and it supports her from the damp earth, in the shape of wooden heels, pattens and clogs; nor is she unacquainted with a property in the leaves, with which she strewns her chambers before sweeping, for when fresh they are covered with a glutinous liquor, that entangles fleas, as birds are entangled in bird-lime. The whole tree is very astringent, and well known to the country dyers. The bark is used by them, as well as by the tanner and leather-dresser, and the fisherman is not unacquainted with its utility for tanning his nets.

Those artists, whose lives are spent in the Gobelins, to throw a semblance of nature into tapestry, borrow their shades for flesh colours from this tree

with the assistance of a little copperas. The young shoots dye yellow, but if cut in the spring when full of sap they dye a cinnamon colour. The fresh wood yields an amber tint; the catkins a tolerably good green; and the bark is employed as a basis for black, particularly in dying cotton. An ounce of it dried and powdered, boiled in three quarters of a pint of water, with an equal quantity of logwood, with solution of copper, tin, and bismuth, 6 grains of each and two drops of solution of iron vitriol, will dye a strong deep *bou-de-Paris*.

The Laplanders chew the bark, and colour their leather garments red with their saliva. The bark and the fruit together yield a tolerably good ink. The roots and knots furnish the cabinet-maker with a beautifully veined wood. The Scotch Highlanders often make chains of it, which are very handsome, and the colour of mahogany. The wood which has lain in bog is black like ebony. The boughs cut in summers, spread over the land, and left during the winter to rot, are found to answer as a manure, clearing the ground in March of the decayed parts, and then ploughing it.

Linnaeus says, that horses, cows, sheep, and goats eat it, but that swine refuse it. The tongues of horses feeding upon it are turned black, and it is supposed by some persons not to be wholesome for them.

Many botanists, and among others Linnaeus himself, have separated the Alder from the Birch; but Linnaeus, in his later works, has joined them in the same genus; convinced, as he says, by the second and third species, that nature has placed no limits between them. Gertner however keeps them distinct, and says that they differ not only in the fruit, but in the flower. Native of Europe from Lapland to Gibraltar, and of Asia from the White Sea to Mount Caucasus, in wet and boggy grounds, and on the banks of rivers: flowering with us in March and April.

Mr. Miller, probably intending to remove the article *Alnus* to that of *Betula*, has entirely omitted the former in the eighth folio edition of his dictionary. In the seventh he makes three species of the Alder.]

1. *Alnus obverse ovatis rugosis. Alder with obovate wrinkled leaves. A. rotundifolia glutinosa viridis. Bark*

pin. 428. *Common or round-leaved Alder.*

2. *A. foliis ovato-lanceolatis, marginibus dentatis. Alder with ovate-lanceolate leaves, indented on their edges. A. folio oblongo viridi. Bauh. pin. 428. The long-leaved Alder. See n. 11.*

3. *A. pumila folio rotundo serrato. Dwarf Alder with a round serrate leaf. A montana, lato crispo glutinoso folio, serrato. Bocc. mus. 2. 138.*

1. The first is our common Alder. 2. The second is oblongata. 3. The third grows naturally on the Alps and Appennines; it is a very humble shrub, seldom rising more than a foot high, the branches always trailing on the ground.

The Alder, delighting in a very moist soil, where few other trees will thrive, is a great improvement to such lands. It is propagated by layers, cuttings, or truncheons about three feet in length. The best time for planting truncheons is in February or the beginning of March; they should be sharpened at one end, and the ground must be loosened with an iron crow before they are thrust into it, that the bark may not be torn off. They must be planted at least two feet deep, to prevent their being blown out of the ground by strong winds, after they have made their shoots. The plantations should be cleared at first of tall weeds; but when the trees have made good heads, they will require no farther care.

If you raise them by layers, this operation must be performed in October, and by the October following they will have taken root sufficiently to be transplanted. They should be set at least a foot and half deep in the ground; and their tops must be cut off to about nine inches above the surface, which will occasion them to shoot out many branches.

[In other countries the Alder is raised from seeds, but I do not know that it is practised in England.]

The distance these trees should be planted, if designed for a coppice, is six feet square; (or they may be planted at first a yard square, and at seven years end, when they are felled for poles, every other stool may be taken away); and if the small lateral shoots be cut off in the Spring, it will very much strengthen the upright poles,

provided a few small shoots be left at certain distances upon the body to detain the sap, for the increase of its bulk.

These trees will also thrive exceedingly on the sides of brooks; and may be cut for poles every fifth or sixth year. They may also be planted for hedges, in moist ground, where they thrive very fast, and may be trained into very thick close hedges, to the height of twenty feet and upwards. (They may also be used for securing the banks of rivers, by planting truncheons very close, or crosswise.) The leaves being large, and of a deep green, have a good effect, and the trees make a much better figure than most other aquatic trees; so that where the beauty of such plantations is considered, these should be preferred to other trees usually planted in swampy grounds.

[In planting Alders for coppices, it is much better to raise them from young trees than from truncheons. To obtain a quantity of these, plant suckers, and head them down for stools: lay the shoots the succeeding Autumn, and in twelve months they will have taken root; then remove and plant them in rows; in one or two years they may be planted where they are to remain. If the coppice is to be on boggy or watery ground, they may be removed from the nursery, and planted three feet asunder in holes previously prepared. Here they may stand six or seven years, when half the trees may be taken away, and the rest cut down for stools. Every nine or tenth year will afford a fall for poles.

There is a variety with cut leaves sold by the nurserymen as an ornamental tree, though it is more curious than showy.]

2. *ALNUS OBLONGATA* (oblong-leaved Alder). *Leaves oblong, bluntish, glutinous; axils of the veins naked.*—The leaves are longer, narrower, and not so glutinous as the common sort; they are also not so rough, and are of a thinner consistence. It is very common in Austria and Hungary, [whence Mr. Miller received the seeds, and cultivated it in 1759.]

3. *ALNUS INCANA* (hoary Alder). *Leaves oblong, acute, downy beneath; axils of the veins naked; stipules lanceolate.*—The hoary or silver-leaved Alder is totally distinct from the com-

mon sort, both in the structure of its parts, and its economical uses. It never attains the size of that, and is commonly shrubby: the trunk is scarcely thicker than the human arm: the wood is white and of a closer texture. Branches and twigs even, testaceous, hoary, diverging at half a right angle. Leaves not round, but ovate, drawn out at the end, unequally serrate with very sharp toothlets, sometimes doubly-serrate with very obscure incisions, very smooth and somewhat glutinous even beneath, except at the divisions of the nerves, where they have a close thick pubescence. The male catkins are sessile at the ends of the branches, usually by threes; they are two inches long, the thickness of a swans quill, and the scales ferruginous. Female catkins one on each side, having two or three bundles between the shining brown testaceous scales, coming out with a leaf or two, alternate on the peduncles; when in flower they are of a brownish-green colour, and of an oblong cylindric form; when ripe they are smaller than those of the common Alder, not divaricate, and in other respects different. Native of the alpine and subalpine parts of Switzerland, Dauphine, in eastern Siberia, in the islands beyond Kamtschatka &c. It was introduced here in 1780, by Mr. John Bush.

Hoary Alder, growing naturally in dry sandy soils, may perhaps be cultivated with the Birch, where land is of little value, as an underwood, and may be propagated either by layers or cuttings, as well as by seeds, where they can be obtained.

The varieties of the hoary Alder are the cut-leaved, the dwarf alpine, the long-leaved, and the rose-flowered, with petals like bractes produced from the middle catkin.]

4. *ALNUS SERRULATA* (notch-leaved Alder). Abb. ins. 2. t. 92. *Leaves obovate, acuminate; veins and axils of veins beneath, hairy; Stipules elliptical, blunt.*—Native of Pennsylvania. Cultivated in 1753, by P. Collinson, Esq. Flowers in March. Increased by layers; planted in loam and peat.

[5. *ALNUS CORDIFOLIA* (heart-leaved Alder). *Leaves cordate acuminate, entire lurid above.*—This beautiful tree is a native of Naples; it was introduced in 1820, and bears our winters without the smallest injury.

It is of rapid growth, with smooth leaves, which are vastly larger than those of any species of Alder. The tree will probably obtain a great size. The flowers are produced in the month of April, before the development of the leaves. It may be increased by layers, and will grow in any soil; particularly if somewhat moist, as the whole family delights in wet.

The varieties of the different species may be continued by layers. Cuttings also set in a moist shady border the beginning of October, will frequently grow; but this not being a sure method, and the other an easy one, this scarcely deserves to be put in practice.]

ALOE (A word for which several derivations have been offered. That it has been obtained from the Arabic *alloe*, seems most probable.

Class 6. 1. Hexandria Monogynia.
Nat. Ord. *Hemerocallidæ*. *Lilia* v. *Liliaceæ*, *coronariæ* of Linn. and *Asphodeli* of Juss.

The Characters are,—*Calys none; corolla one-petalled, erect, sexfid, oblong, tube gibbous, border spreading, small, nectareous at the bottom; stamina with awl-shaped filaments as long as the corolla or longer, inserted into the receptacle; anthers oblong incumbent; pistilum an ovate germ; style simple, length of the stamina; stigma obtuse, trifid; pericarpium an oblong three-furrowed, three-celled, three-valved capsule; seeds several, angular.*

Obs. This genus has been recently divided by Mr. Haworth and others, into many Genera, which arrangement we shall follow.

1. *ALOE DICHOTOMA* (smooth stemmed Aloe). *Stem dichotomous; Leaves ensiform, serrated; stamens longer than corolla.*—The trunk is round, upright, very stiff, ash-coloured, smooth, and of an extremely even surface, dichotomously branched at top, two fathoms in height, the thickness of a man's thigh. Branches dichotomous, upright, a foot and more in length, leafy at top. Leaves perfoliate, sword-shaped, toothletted, convex beneath, flat above, from spreading becoming upright, smooth, fleshy, a foot long, the upper ones gradually smaller. Native of the Cape of Good Hope. The Hottentots hollow out the trunk of this species to make quivers for their arrows. Introduced 1780, by Mr. William Forsyth.

2. ALOE PURPURASCENS (purple Aloe).

Bot. mag. t. 1474. *Leaves ensiform, glaucous, recurved at end; Marginal serratures white.*—The flower stem of this species seldom exceeds two feet in length; the foliage is of a darkish dull green, clouded over with a grey bloom or hoar; the corolla is of a dark brick-red colour, green at the top; about an inch and a half in length. Like the *socotrina*, when aged, it has a dichotomous stem, and no radical offsets. A native of the Cape of Good Hope. Introduced 1789.

3. ALOE SOCOTRINA (Socotrine Aloe).

Bot. mag. 472. *Leaves oblong, ensiform, somewhat spotted; edges cernuous, white, with straight spines.* The Socotrine Aloe is a perennial plant, with a strong fibrous root; flowering in winter and spring. The stem is round, smooth, erect, of a glaucous green colour, towards the top beset with ovate bracteal scales, and rises to the height of three or four feet. The leaves are numerous, spreading, and proceed from the upper part of the root; they are about two feet long, broad at the base, tapering gradually to a point, thick, fleshy, succulent, channelled, glaucous, smooth, and armed at the edges with remote, whitish, horny teeth. The flowers are produced in terminal spikes, of a purple or reddish colour, each flower being accompanied with a single ovate, acute, broad, membranous bracte, white, with three green streaks, and shorter than the corolla. The corolla is bell-shaped, and divided into six narrow petals, the three inner segments are white, with three green lines; the outer segment narrower and less concave. The filaments are six, tapering, yellowish, inserted into the receptacle, and furnished with oblong orange coloured anthers; the germens is oblong, with a simple, slender style, and an obtuse stigma. The capsule is oblong, three-celled, containing many angular seeds.

Socotrine Aloes.—The real socotrine aloes, which is rarely met with in commerce, is produced by the *A. socotrina*. It grows in abundance on the island of Socotora, which was first discovered by the Portuguese, in 1503, and now belongs to the Princess of Hadramanbe, a province of Arabia, contiguous to Yemen. This plant is also found in many parts of the south of Africa, particularly in the kingdom of Melinda,

where the greater part of the extract is prepared that is now sold under the name of Socotrine and Cape Aloes. India, Borneo, and Sumatra, also furnish us with this kind of aloes, which are sometimes packed in casks, and at others in skins.

In the island of Socotora, the inhabitants cut or chop the leaves, and make a slight pressure to obtain the juice which is left to settle. It deposits a feculent matter which is thrown away. The supernatant liquor thus freed from its grosser parts, is left to spontaneous evaporation; and it is this difference in the two processes that accounts for the superiority of the real socotrine aloes over that of the Cape: for there the Hottentots cut the end of the leaves and catch the liquor which flows from them in proper vessels, the lower leaves of the plant generally serving for canals to conduct it into them. The juice thus obtained, is at once reduced to a suitable consistence over the fire, and afterwards packed in boxes containing from one to three hundred pounds weight.

4. ALOE SPICATA (spike-flowered Aloe). *Leaves lorate, ensiform, downward spotted with white; marginal spines middle-sized, red.*—Observed by Thunberg at the Cape. It much resembles the second species, but is very different in the spike and figure of the flowers.

Thunberg thus describes it. "Stem round, leafy, at the top, three or four feet high, the thickness of the human arm. Leaves subverticillate, broad at the base, gradually drawn to a point, channelled, acute, with remote teeth, spreading, two feet long. Flowers in very close spikes, spreading horizontally, a foot in breadth. A single bracte under each flower, ovate, acute, broad, membranaceous, white with three green streaks, a little shorter than the corolla: which is bell-shaped, almost six-petalled; the three inner segments not connected, broader, ovate, blunt, white with three green lines; the three outer connected with the others at the base, narrower and less concave, but like them." The flower is full of a purple honey juice.

The best and purest Hepatic Aloe is said to be obtained from this species, which is cultivated extensively at the Cape of good Hope, and a considerable part of what is sold as coming from Socotora, is from that quarter. All the

medical aloes are grown on the poorest soil. At the Cape, in the month of July, the leaves are pulled, then cut in pieces, the juice expressed, and inspissated by means of heat. Introduced 1735.

5. *ALOE ARBORESCENS* (tree Aloe). Bot. mag. t. 1306. *Leaves stem-clasping, reflexed, spiny at edge.*—This species is the tallest of the Aloes; it will grow to the height of ten or twelve feet, with a strong naked stem, the leaves growing at the top, which closely embrace the stalk; they are about two inches broad at their base, growing narrower to a point, and are reflexed, and indented on their edges, each being armed with a strong crooked spine. The leaves are of a sea-green colour, and very succulent. The flowers grow in a pyramidal spike, are tubulous, and of a bright red colour. These are in beauty in November and December.

This sort will live through the Winter in a good green-house, but they will not flower unless they have a moderate share of warmth, therefore the pots should be removed into a stove in October, which should not be kept above temperate heat, in which situation they seldom fail to flower. Introduced 1731.

6. *ALOE FLAVISPINA* (yellow-spined Aloe). Haw. in Lin. Tr. vol. 7, p. 22, No. 48. *Suckers from the root; leaves oblong, acuminate, glaucous, spreading, covered at side and back with very broad brown spines.*—A native of the Cape of Good Hope. Introduced 1790.

7. *ALOE MITRÆFORMIS* (common mitre Aloe). Bot. Mag. t. 1270. *Leaves thick, spiny at edged below spinulose, appressed, not dotted; racemes in umbels.*—Grows with an upright stalk, to the height of five or six feet; the leaves closely embrace the stalks: they are thick, succulent, broad at their base, growing narrower and ending in a point, of a dark green colour, and have spines on their edges, as also a few on their upper surface; they stand erect, and converging towards the top; form the resemblance of a mitre, from whence it is called the Mitre Aloe. The flower-stem rises about three feet high, the flowers come out at the top of it in a sort of globular spike, which afterwards becomes cylindrical; these have long foot-stalks,

which stand horizontally, and the flowers hang downward; they are tubulous, and cut into six unequal segments to the bottom, three being alternately broader than the others. There are six stamina, three of which are as long as the tube of the flower, the other three are shorter. These are crowned with flat oblong summits of a gold colour. The three-cornered germen is situated in the bottom of the flower, supporting a single style, which is shorter than the stamina, having no stigma on the top. The tube of the flower is of a fine red colour, and the brim is of a pale green, so that it makes a pretty appearance when the spikes of flowers are large. Blooms from July to December. Propagated by suckers and seeds from which last, Miller raised the plant, but did not find it vary in the extraordinary way that Linnæus supposed.]

This sort will live in a warm dry green-house, in winter, and may be placed in the open air in summer, in a sheltered situation; but the plants should not have much wet, lest it should rot their stems. With this management the plants will not grow so fast as when they are placed in a stove, but they will be stronger, and their stems will support their heads much better.

8. *ALOE DISTANS* (small mitre Aloe). Bot. mag. t. 1362. *Leaves erect spreading, remote, ovate, acute; spines marginal, numerous, white.* This species has the most distant leaves of all; the stem is often more than three feet high. A native of the Cape of Good Hope. Introduced 1732.

9. *ALOE COMMELINI* (Commelin's Aloe). *Leaves ovate, oblong, attenuate, spreading, glaucous; the edge and keel upwards with white spines.*—A native of the Cape of Good Hope. Introduced 1819.

10. *ALOE NOBILIS* (great mitre Aloe). *Leaves erect broadly-ovate, acute, spines marginal numerous white.* This species is generally more than five feet in height, it produces its flowers which are of a red colour in the month of August.—A native of the Cape. Introduced 1800.

11. *ALOE VULGARIS* (Hepatic, Barba-does, or common Aloe). Plant grass 27. *Leaves spreading ascending, spiny at edge, peduncle branched; branches with a double bractea.* The Kaianaku or

Catevela of Rheed, growing in the sandy stony soil of Malabar, and many parts of India, and also in several provinces of America, as Mexico, New Spain, Brasil, and Barbadoes; and yielding, by its purified juice, hepatic aloes, and from its dregs a less pure extract, called cabaline aloes; the leaves are about four inches broad at their base, where they are near two inches thick; they have a few indentures on their edges; are of a sea-green colour, and when young are spotted with white. The flower-stem rises near three feet high, and the flowers stand in a slender loose spike, with very short peduncles, and hang downwards; they are of a bright yellow colour, and the stamens stand out beyond the tube.]

This never produces seed in England, and is too tender to live through the winter in our climate, in a common green-house, therefore it should be placed in a moderate degree of warmth in that season. I have known plants of this kind, which have had an oiled cloth tied up about their roots, and hung in a warm room more than two years, and afterwards planted in pots, which have grown very well, from whence the plant has been called *Sempervivum* by the inhabitants of America. Introd. 1596.

[12. *ALOE CHINENSIS* (Chinese Aloe). *Leaves smooth pale-green, straight, erect, spreading, soft.*—A native of China with yellow flowers. Introduced 1821.

13. *ALOE CASIA* (Cæsious Aloe). *Stem shrubby; leaves long-lanceolate, recurved at end, glaucous, smooth, spotted with red spines.*—From the Cape of Good Hope. The flowers which are of an orange colour are produced in July. Introduced 1818.

14. *ALOE ALBISPINA* (white spined Aloe). *Leaves ovate-oblong, acute, edges keeled, thickly set with spines, spines long.*—This is a very fine species, and the largest spined of all the Genus. The tips of the older spines are tinged with a yellow colour. They never produce any offsets, and has not yet flowered in Europe.

15. *ALOE GLAUCA* (Glaucous Aloe). Bot. Mag. 1278. *Leaves very glaucous, spines red.*—Decandolle observes that this species differs from *mitraformis* by a trunk that is not arborescent; soft glaucous leaves with red spines; flower stem nearly covered with bractes; and a corolla green at the top; as well as in

habit and time of flowering. A native of the Cape of Good Hope; of long standing. Should be kept in the green-house. Introduced 1731.

16. *ALOE LINEATA* (striped red spined Aloe). *Leaves green, striped; spines red.*—This is the greenest-leaved of all. There is only one plant of it alive in Britain. Haworth.

17. *ALOE DEPRESSA* (flat-leaved Aloe). Bot. Mag. t. 1332. *Distinguished from A. serra, by the spines not being united at base.*—This species was well named by Aiton; it is clearly the most depressed of all the Genus. It is also an abundant producer of offsets. The stem is simple; leaves about two inches broad at the base, five long; corolla pale red, greenish towards the end. Native of The Cape of Good Hope. Blooms in the summer. Introduced 1731.

18. *ALOE BREVIFOLIA* (Lesser proli-ferous Aloe). Bot. Reg. 996. *Subacaulis, foliis lanceolatis acutis glaucis; marginibus carinaque apice, spinosis viz cartilagineis; subtus subtuberculatis.* Haworth *revis succ* 202.—This is an humble plant seldom rising more than a foot high; the leaves grow near the ground, which are broad at their base, where they embrace the stalk, and gradually diminish to a point; they are of a sea-green colour, with some white spots; their edges, and also their upper parts below and above, are beset with pretty sharp spines; the flowers grow in loose spikes, the subulous part being red, and the brim of a light green colour. Produces abundance of offsets.

19. *ALOE SERRA* (saw-leaved Aloe). *Leaves tufted, with the spines of the edge united at base; scape toothed.*—This species is about four feet in height, flowers of an orange colour, are produced in July. A native of the Cape. Introduced 1821.

20. *ALOE STIATA* (streaked Aloe). Jacq. fragm. t. 62. *Leaves glaucous, streaked; edge obsoletely toothed.*—This species possesses very small marginal spines. It is a native of the Cape. Introduced 1795.

21. *ALOE ALBOGINCTA* (white-edged Aloe). *Glaucous polished; leaves oblong, acuminate, with a deep white entire cartilaginous edge.*—Flowers in June; they are of an orange colour. Introduced 1812.

22. *ALOE SERRULATA* (serrulated Aloe). Bot. mag. t. 1415. *Leaves*

spotted; edges and keel serrulate at end.

—Very closely allied to *variegata*; but is altogether a much larger plant, with multifarious ambient leaves not trifariously decussate as in that, and which are also of a much duller greyish green not undulately variegated as these, but marked with rather large distinct oblong white blotches; the pedicles are about half the length of the corolla, and not three or four times shorter than that, as in *variegata*.

Mr. Miller, after describing the *variegata*, says, "I have raised a variety of this from seeds received from the Cape of Good Hope, with broader and flatter leaves, which spread more than those of the former, and are not so beautifully spotted; but as these plants have not yet flowered, I do not know if it will prove a distinct species." *This is, most probably, the present species.*

Native of the Cape of Good Hope. Introduced before 1789.

23. ALOE OBSCURA (great soap Aloe.)

Bot. mag. t. 1323. *Leaves spotted, thorny at the edge.*—This species resembles the *A. latifolia* in its manner of growth; but the leaves are broader, of a lighter green colour; the edges, and also the spines are of a copper colour; and the flowers grow in loose spikes. Native of the Cape. Cultivated in Sherards garden, at Eltham, requires to be kept in a good green house, where it flowers about August or September.

24. ALOE LATIFOLIA (largest, or broad-leaved common soap Aloe). Bot. mag. t. 1346. *Leaves ovate, lanceolate, pale green, with obsolete whitish barred spots; spines rufous.*—The caudex seldom rises above two feet high; the leaves are of a dark green colour, spotted with white; they are the broadest of all the aloes. Corolla nearly two inches long; of a beautiful red lead colour. The bloom appears in August or September. Native of the Cape of Good Hope; an old inhabitant of our greenhouses.

25. ALOE SAPONARIA (common soap Aloe). Bot. mag. t. 1460. *Leaves oblong; lanceolate, dull green, rather glaucous, with oblong large transverse spots, and rufous spines.*—Seldom rises much above two feet high; the leaves are very broad at their base, where they closely embrace the stalk, and gradually decrease to a point. The edges are set with sharp spines, and the under leaves

spread open horizontally every way; these are of a dark green colour spotted with white, somewhat resembling the colour of soft soap, from whence its whimsical specific name. The leaves assume a liver-coloured tint when placed in the open air, during summer. The same plant produces sometimes a simple, at others a corymbosely branched flower stem. The flowers grow in umbels on the tops of the stalks, which are of a beautiful red colour, and appear in August and September. It is altogether a less plant than the *latifolia*, having narrower leaves, which are straighter at the sides; the raceme is also shorter and fewer flowered. This sort is hardy, so may be kept in a common green-house in winter, and in the summer placed in the open air.

26. ALOE MICROCANTHEA (small-spined Aloe). Bot. Mag., 2272. *Leaves narrow sword-shaped, beneath spotted with white spots, warty scattered.*—In this species the leaves are linear-lanceolate, scarcely a foot and a half long, half an inch wide at the base, and gradually tapering to the point; deeply channelled margins armed with very minute white spines somewhat recurved, palish green with white oval distinct spots, not very fleshy, and of a supple consistence; scape nearly a foot long, semicylindrical at the lower part, and rounded above, clothed with distinct, ovate, acuminate, streaked, scariosae bractes, half embracing the stem; flowers in a terminal, subumbellate, lax raceme, at first erect, then nodding; peduncles white, erect, longer than the corolla, which is cylindrical, an inch and half long, with rose-coloured petals, tipped with green, a little recurved at the point; the three exterior ones somewhat the shortest; filaments unequal; anthers oval, orange-coloured; style the length of the corolla; stigma capitate. This rare species is said to be found only in The Royal Gardens at Kew. Introduced 1819.

27. ALOE VIRENS (Apple-green Aloe). Bot. Mag. t. 1355. *Leaves oblong lanceolate, green sparingly spotted, edges with a few distant green spines.*—Native of The Cape of Good Hope; nearly allied to the *humilis*; the caudex is sometimes scarcely above the level of the ground, at others half a foot high, throws out abundance of suckers, so as to become bushy; leaves of a bright apple-green colour, about an inch broad

at their base; *flowers* of a yellowish red tint, about an inch and half long. Blooms in the Autumn; of easy culture. Introduced 1790.

28. ALOE TUBERCULATA (tuberculated hedge-hog Aloe). *Leaves acuminate above, a little hollow, very prickly all over.* The flowers, which are of an orange colour, are produced from March to May. A native of the Cape. Introduced 1796.

29. ALOE ACUMINATA (middle hedge-hog Aloe). Bot. mag. t. 757. *Leaves acuminate, glaucous above, flat, smooth, sparingly prickly beneath, very rough.* An old inhabitant of our gardens. It is stemless. *Leaves* surrounding the scape tuftwise, assurgent, and often slightly incurved upwards, broad, subulate, plano-convex, sometimes nearly trigonal, beset with white subcartilagineous softish spines; these at the edges are teeth-like, regularly arranged, more numerous and perfect in shape, but in the other parts are often abortive, and appearing like little white pustules. *Scape* central, upright, from half a foot to two feet high, beset from the base with convolute, acuminate, membranous, white bractes, resembling the upper fertile ones. *Raceme* spiked, longish, not very thickset. *Pedicles* about the length of the bracte and corolla, upright. *Corolla* pendulous, cylindrical, parted to the base, three outer segments narrowest and more succulent, inner ones nearly membranous, all patulously reflected at the mouth. *Filaments* slightly unequal, nearly the length of corolla, subassurgent. *Stigma* simple. A native of the Cape; flowers orange coloured. Produced in April. Requires the same treatment as the rest of the genus. Introduced 1798.

30. ALOE VARIEGATA (partridge-breast Aloe). Bot. mag. t. 513. *Leaves trifurcous, painted, channelled; angles cartilaginous.* So many desirable points unite in this aloe, that we cannot wonder at its being held in such very high esteem by all that have the least taste for plants, especially those of the succulent kind; we frequently see it nursed up with great care by those who have only the convenience of a parlour window, and succeed better with such than in the green houses of many; it grows readily and blows freely, but irregularly, during most of the summer months; its foliage is beautiful, both in

its form and markings, and its flowers are no less handsome.

Partridge-breast aloe seldom exceeds a foot or a foot and half high. The leaves are triangular, and turn back at their extremity; they are fleshy and entire, their edges being very slightly serrated; they are curiously veined and spotted, somewhat like the feathers on a partridges breast. The flowers grow in very loose spikes, upon stalks about one foot high; they are of a fine red colour tipped with green. Corolla flesh-coloured with a sexfid mouth, the three inner divisions alternate, spreading; stamens bending down, stigma simple. I have raised a variety of this from seeds which I received from the Cape of Good Hope, with broader leaves, which spread much more than those of the former, and are not so beautifully spotted; the flower stalks also grow much taller.

Is increased by offsets, and requires the same treatment as the aloe tribe in general. This has a creeping root, and has not one species nearly allied to it in all the genus. Is a native of the Cape, and was cultivated here by Mr. Fairchild in 1720.

31. ALOE HUMILIS (dwarf hedge-hog Aloe), Plant. grass. 39. *Stemless; leaves spiny, ascending, three-cornered subulate.* This plant is a native of the Cape of Good Hope, and, according to Mr. Haworth, was cultivated in 1731. It is a very desirable kind, producing its beautiful flowers regularly in April and March, and sometimes later.

It requires the simple protection of the greenhouse in winter, with little or no water during that season; in the summer it should be placed in a sunny situation, out of doors. It increases itself occasionally by offsets; the soil should be sandy loam.

USES OF ALOES.

Among the Mahometans, and particularly in Egypt, the aloe is a kind of symbolic plant, and dedicated to the offices of religion: for pilgrims, on their return from Mecca, suspend it over their doors as an evidence of their having performed that holy journey. The superstitious Egyptians imagine that it has the virtue of keeping off apparitions and evil spirits from their houses, and it is hung over the doors of Christians and Jews in Cairo for this purpose. They also distil from it a

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water, which is sold in the shops, and recommended in coughs, asthmas, and hysterics. Hasselquist mentions a person who was cured of the jaundice in four days by taking four tea-cupsful of it. The Arabians call it *sabbara*. The negroes, as we are informed by Adanson, in his voyage to Senegal, make very good ropes of the leaves of the Guinea aloes, which are not apt to rot in water. M. Fabroni, as we learn from the *Annales de Chimie* (vol. xxv.) procured from the leaves of the *aloe socotrina* a violet dye, which resists the action of oxygen, acids, and alkalies. This juice, he says, produces a superb transparent colour, which is highly proper for works in miniature, and which, when dissolved in water, may serve either cold or warm, for dyeing silk from the lightest to the darkest shade; and he reckons it one of the most durable colours known in nature. Aloes was used among the ancients, in embalming, to preserve bodies from putrefaction. Of this aloes, interpreters understand that to have been which Nicodemus brought to embalm the body of Christ. John, xix. 3.

Aloes, whose resinous part is not soluble in water, has been used as a preservative to ships' bottoms against the worms, to which those that trade to the East and West Indies are particularly subject. One ounce of aloes is sufficient for two superficial feet of plank; about 12lb. for a vessel of fifty tons burthen, and 300lb. for a first rate man of war. It may be incorporated with six pounds of pitch, one of Spanish brown, or whiting, and a quart of oil; or with the same proportion of turpentine, Spanish brown, and tallow. Such a coat, it has been said, will preserve a ship's bottom eight months, and the expense, for a first rate ship will be about 18*l*. The same composition may be used in hot countries for preserving rafters, &c. from the wood-ant. The efficacy of aloes, as a defence against worms, has, however, been controverted.

ALOES, in Medicine and Pharmacy, the inspissated juice of various species of the Aloe above described. Of this there have been usually reckoned three kinds, viz. the *socotrine hepatic*, and *caballine*.

1. *Socotrine aloes*, so called from the island Socotora, from which it was first

brought, though it was probably imported from the Cape by the Dutch East India Company, is obtained from the *A. socotrina*. This sort is the purest and most transparent: and is of a bright surface, and in some degree pellucid.

Socotrine aloes is in solid fragments, compact, heavy, and brittle. It is of a yellowish red or brown colour, in proportion to its purity; is glossy, and breaks with a smooth conchoidal fracture. The thin edges are reddish and semi-transparent. It is rendered friable by cold, softens by heat, and is adhesive to the touch; is easily reduced to powder, which is of a golden yellow colour. The odour is strong, *sui generis*, the inferior sorts fetid and nauseous. The taste is bitter, accompanied with an aromatic flavour, but not sufficient to prevent its being disagreeable; the smell is not very unpleasant, and somewhat resembles that of myrrh.

2. *Hepatic, Barbadoes, or common aloes*, is obtained from another species, viz. *A. vulgaris*, and is usually brought to us from Barbadoes; that of the best sort in large, gourd shells, an inferior kind in pots, and a still worse in casks. It is of a darker colour than the former, and not so clear or bright; generally drier and more compact; of a stronger and more disagreeable smell, and of an intensely bitter taste, with little or nothing of the aromatic flavour of the other. A tract of mountains about fifty miles from the Cape of Good Hope is wholly covered with the aloes plants, which renders it unnecessary to plant them there; but they are now cultivated in Jamaica and Barbadoes, having been first brought to the former of these islands from Bermuda. They require two or three years standing before they yield their juice in perfection. *The mode of procuring it*, says Dr. Brown, is in the following manner:—The labourers go into the field with tubs and knives, and cut off the largest and most succulent leaves close to the stalk; these they put into the tubs in an upright position, that the looseliquor may be drained from the wound. When this is almost wholly discharged, the leaves are taken out singly, and cleared of any juice that may adhere to them: and the liquor is put into shallow flat bottomed vessels, and dried gradually in the sun, till it acquires a proper con-



MODE OF GATHERING THE BARBADOES ALOES.

sistence. What is obtained in this manner is called *socotrine aloes*, and is the clearest and most transparent, as well as the highest in esteem and value.

In the island of Barbadoes, according to the account of Mr. Millington, after a sufficient quantity is drained from the leaves to make it an object for the boiling-house, and the juice with this view may be preserved for some weeks, without injury, three boilers of iron or copper are placed by one fire, though some have two and others only one;

these are filled with juice, and as it is gradually inspissated by a regular fire, it is ladled from boiler to boiler, and fresh juice is added to that which is farthest from the fire, till the juice in that which is nearest to the fire, the smallest of the three, and called *tatch*, becomes of a proper consistence to be shipped or ladled out into gourds, or other small vessels placed for receiving it. The proper time for ladling it out of the *tatch* is when it is arrived at a resin height, as it is termed, or when it cuts

freely, or in thin flakes from the edges of a small wooden slice, that is dipped from time to time into the tatch for that purpose. A little lime water is used by some aloë-boilers during the process, when the ebullition is too great. This author adds, as to the *sun-dried aloes*, which is most approved for medicinal purposes, very little is made in Barbadoes. The process, however, is very simple, though very tedious. The raw juice is either put into bladders, left quite open at top, and suspended in the sun, or in broad shallow trays of wood, pewter, or tin, exposed also to the sun every dry day, until all the fluid parts are exhaled, and a perfect resin formed, which is then packed up for use, or for exportation.

Dr. Wright gives the following account, somewhat different from the former of the *method of preparing hepatic Aloes in Jamaica*. The plant is pulled up by the roots and carefully cleaned from earth or other impurities. It is then sliced and cut in pieces into small hand-baskets or nets. These nets or baskets are put into large iron boilers with water, and boiled for ten minutes, when they are taken out, and fresh parcels supplied till the liquor is strong and black. At this period the liquor is thrown through a strainer into a deep vat, narrow at the bottom, to cool, and to deposit its feculent parts. Next day the clear liquor is drawn off by a cock, and again committed to the large iron vessels. At first it is boiled briskly, but towards the end the evaporation is slow, and requires constant stirring to prevent its burning. When it becomes of the consistence of honey, it is poured into gourds or calabashes for sale. The *socotrine aloes*, he says, may be prepared in the same manner.

3. *Caballine*, or *horse aloes*, is obtained (as some say) from the fæces of the hepatic aloes, and, according to others, from a distinct variety. It is easily distinguished from the two former by its strong rank smell. In other respects it agrees pretty much with the hepatic, and is not unfrequently sold for it. Sometimes it is prepared so pure and bright as scarcely to be distinguishable by the eye, even from the socotrine, but its offensive smell soon betrays it; and if even this should be dissipated by art, its wanting the aromatic flavor of the finer aloes will be a sufficient criterion.

Some say, that its colour is also much darker, indicating a mixture of sordes and sand, and that it is of course much more compact and heavy. This aloë is not admitted into the *Materia Medica*, and is employed chiefly by farriers.

From the observations of Professor Murray, it appears probable, that different species, as well as varieties, of aloë, would furnish the various kinds of this drug, and that Linnæus by referring these sorts to those plants, the recent juice of which seemed to correspond respectively the nearest them in taste, might easily be misled; for Murray, upon tasting the fresh juice of many different species of aloë, sometimes found it bitter, and at other times totally devoid of bitterness.

Aloes is mentioned neither by Hippocrates nor Theophrastus; Dioscorides mentions two kinds, and Avicenna tells us, that of the different kinds, without naming them, the socotrine is the best. Celsus, who frequently mentions aloes, and recommends it to be mixed with all cathartics, does not distinguish it by any epithets. If, indeed, the account of J. Bauhin (*Hist. Plants*, tom. iii. p. 697) be true, that the juice of the leaves forms itself spontaneously into three strata, the upper being the socotrine, the middle the hepatic, and the lowest or fæces the caballine; there may be some reason for the distinction of the three names, that have been uniformly appropriated to them.

All the kinds of aloes agree in this, that they consist of a resinous matter, and a large proportion of a substance called gum; and that they dissolve in pure spirit, proof spirit, and proof spirit diluted with half its weight of water, the impurities only being left; and in boiling water they also dissolve, but when the liquor becomes cold, the resinous parts subside. The quantity of resin in hepatic aloes appeared in experiments of Dr. Lewis to be one third, in socotrine aloes one-fourth, and in the caballine one-sixth. According to Boulduc, the socotrine aloes contains no more than one-eighth of resin, and the hepatic aloes contains half its weight; and therefore the hepatic aloes contains more resin and less gum than the socotrine, and this than the caballine. The resins of all the sorts, purified by solution in spirit of wine, have little smell; that of the socotrine has

scarcely any perceptible taste; that of the hepatic a slight bitterish relish; and that of the caballine a little more of the aloetic flavour. *The gummy extracts* are less disagreeable than the crude aloes; that of the socotrine aloes has very little smell, and its taste is scarcely unpleasant; the smell of the extract of the hepatic is somewhat stronger, but its taste more agreeable than that of the socotrine; the gum of the caballine retains a considerable share of the rank smell of this sort of aloes, but its taste is not more unpleasant than that of the extracts of the other kinds.

Aloes is a well known purgative; and it acts not only when taken internally, but when externally applied; and its cathartic quality resides chiefly in the gummy part, for the pure resin has little or no purgative virtue. Boerhaave declares it to be an effectual and safe cathartic; nevertheless in large doses it produces much heat and irritation, particularly about the rectum, from which it sometimes occasions a bloody discharge. It is powerfully antiseptic; and commonly makes an ingredient in tinctures and balsams for cleaning and healing wounds or putrid sores. *As to the choice of the different kinds of aloes*, it may be observed, that the socotrine, which contains more gummy matter than the hepatic, purges with more certainty and greater irritation, and is, therefore, most proper where a stimulous is required, or for promoting the uterine discharge; but the hepatic is better calculated for the purpose of a common purgative; and as it contains more resin, answers better as a vulnerary, for external application.

The dose of aloes is from half a scruple to half a drachm; but it is, however, seldom given alone. It is the basis of most of the empyrical pills, as Anderson's, Hoopers, Dixon's antibilious, James's Analeptic, Fothergill's, &c. &c. that owe their activity chiefly to the aloes they contain.

The price of Barbadoes aloes at the present time is 2*l.* per cwt. including the duty, which is 2*d.* per lb.; at the same period of the year 1830, this drug was 10*l.* per cwt., the duty being then 1*s.* 3*d.* per pound.

The price of dry hepatica in bond, is from 5*l.* to 14*l.* per cwt. and of aloes from the Cape, 2*l.* to 5*l.* per cwt. A

duty is charged on foreign aloes of 8*d.* per lb.

PROPAGATION AND CULTURE.

The soil in which these plants thrive best, is one half fresh, light earth, from a common; and if the turf is taken with it, and rotted, it is much better; the rest should be white sea-sand, and sifted lime-rubbish, each of these two, a fourth part; mix these together six or eight months at least before it is used, observing to turn it over often in this time. The middle of July is a very proper season to shift the plants; at which time you may take them out of the pots, and with your fingers open the roots and shake out as much of the earth as possible, taking off all dead or mouldy roots, without wounding the young fresh ones; then fill the pot about three parts full of the above mentioned earth, putting a few stones at the bottom of the pot to drain off the moisture; and after disposing the roots in such a manner as to prevent their interfering too much with each other, put in as much of the same earth, as to fill the pot almost to the brim, shaking the plant so as to let the earth in between the roots, and settling it close to the roots with your hand to place it steady in the pot; then water them gently, and set them abroad in a shady place, where they may remain for three weeks, giving them gentle waterings, if the weather be hot and dry.

Toward the latter end of September, in a dry day, remove them into the house again, observing to give them as much free open air as possible, while the weather continues warm; but if the nights are cool, you must shut up the glasses, and give them air only in the day; and as the cold increases, you must discontinue opening the glasses, only giving them gentle waterings till the middle of October, when you must abate them according to the heat of the house in which they are kept. For those plants which are placed in a stove will require to be watered at least once a week, most part of the Winter, whereas those which are kept in a greenhouse, without artificial heat, should not be watered in the Winter oftner than once in a month, and in Summer they should not receive too much moisture.

The tender sorts should constantly

remain in the stove, or be removed in the summer to an airy glass-case, where they may have free air in warm weather, but be protected from the rain and cold. With this management the plants will thrive and increase; and such of them as usually bear flowers, may be expected to produce them in beauty at their seasons.

Most of these aloes are increased by offsets, taken from the parent plant when they are shifted, and planted in small spots filled with the earth prepared for the old plants; and these suckers should be quite dry when they are planted, otherwise they will rot. After remaining in the shade for a fortnight, the tender kinds should be removed to a very moderate hot-bed, shading the glasses in the day, and giving them much air. Towards the middle of August, the young plants may be hardened by taking off the glasses in good weather, and admitting the air; and they should be removed into the house towards the end of September, and managed like the old plants. The African aloes generally afford plenty of suckers for increase. *Several of the others may be propagated by taking off some of the under leaves*, laying them to dry for ten days or a fortnight, and then planting them in the soil already mentioned, by putting that part of the leaf which adhered to the old plant, about an inch or an inch and a half, into the earth, and settling the earth about them with a little water; the pot should then be plunged into a moderate hot bed, preserved from the sun, and refreshed with water once a week. The best season for this operation is June.

The method of cultivating the aloe in the island of Barbadoes, described in the Medical Journal, (vol. viii. art. 8. p. 422.) is as follows. The stony and shallow soil, which is in the vicinity of the sea, and subject to drought, and in which the sugar canes will not thrive, best suits the aloe plant. When the stones have been picked up, and laid around the field as a fence, or piled in heaps upon the most barren spots, the land is lightly ploughed and cleared from weeds; then lined in rows at the distance of a foot from one another, and the young plants are set like cabbages, about five or six inches apart from each other. By being thus set they are easily

kept free from weeds, which would obstruct the produce. They may be planted even in the driest season as they need little or no rain; but the usual time is from April to June.

ALOE rosata is a preparation of the socotrine aloes, made by dissolving it in juice of damask roses, and evaporating it to the consistence of a paste. Then more juice is added, and the evaporation repeated, again and again.—This has been held a gentler and safer cathartic than the *aloes* alone. If this be dissolved in a good quantity of the fresh juices of roses, violets, borage, and buglois, mixed in equal proportions, and afterwards reduced by evaporation to its former consistence, the extract, thus prepared, is called *aloe insuccata*, and with the addition of one-third its weight of cream of tartar, *aloe insuccata tartarizata*.

ALOE violata, is prepared by means of the expressed juice of violet flowers: and mixed with half its weight of cream of tartar, it is called *aloe violata tartarea*. But preparations of this kind are obsolete.

ALOE is applied by some writers, to a kind of mineral juice produced in Judea.

This is called fossil, mineral, or metalline aloe.—Some dispute the existence of any such aloe. Others suppose it to be no other than the ASPHALTUS.

ALOES, lignum. This wood, by the Indians and Portuguese, is called *calamba*, or *calambac*, being the same with what is otherwise called by medical writers *xyloaloes*, and *agallochum*.

This wood is referred by Loureiro, to a distinct genus called *aloexylum*: but it approaches so near to that of the *Excoecaria agallocha* of Linnaeus, that the latter has been sold for it.

ALOEXYLUM.

Clas 10, 1. Decandria Monogynia. Nat. Ord. *Lomentaceæ*, Linn. *Ligaminosa*, Juss.

The Characters are—*CAL. perianthium inferior, of four acute, hairy, deciduous leaves; the lowermost falcate, incurved, nearly twice as long as the rest; COR. petals, 5, unequal, longer than the calyx; STAM. filaments 10; PIST. germ, superior, elongated, curved, compressed; STYLE thread-shaped; VERRIC. legume woody, smooth, falcate; SEED solitary, tunicated.*

ALOEXYLUM AGALLOCHUM (fragrant

aloes-wood). *Bark fibrous, thin; leaves alternate-stalked, lanceolate, flat, entire, smooth, coriaceous; flower-stalks terminal, many flowered.*—The tree grows in

Cochin China, the Molucca islands, and several other parts of the East Indies; and was formerly held in very high estimation, on account of its fragrant odour, as a perfume, for which purpose it was applied to cloaths and apartments, and as a cordial medicine in fainting fits, and in cases of paralytic affection. It is said also to be effectual in destroying the tinea and ascarides in children. By the Chinese and Heathen Moors it was used as incense in their sacrifices, and employed for setting the most precious jewels that are wrought in the East Indies. It was formerly deemed in that part of the world of greater value than gold itself; and various fables have been invented as to the origin of the tree that yields it. Some have feigned that it grew in Paradise, and that it was conveyed from thence by the rivers, which overflowed their banks and swept off the trees in their way. Others pretend, that it grows on inaccessible mountains, where it is guarded by wild beasts, &c. The Siamese ambassadors brought a present of this wood from their emperor to the court of France in 1686; and thus it became known. Bauhin and many others reckon three sorts of it, viz. two kinds of CALAMBAC and the aloes-wood, the agallochum of the shops, the tehinhang of the Chinese, thimhio of Camelli, pao de aguila of the Portuguese, and frequently called eagle-wood. This is oily, resinous, compact, heavy, of a brown reddish colour, marked with grey veins, and often pierced with small holes, as if it were worm-eaten. This wood is not so dear as the calambac, and is more commonly found in the shops. It is brought from Cochin China, and appears to be the production of the same tree. This tree bears a great resemblance to the *agallochum secundarium* of Ramphius, the sinkoo of Kämpfer, and the eagle-wood of Sonnerat; and is denominated *aquilaria malaccensis* and *garo* of Malacca. The wood of the branches of this tree is white, inclining to yellow; and the bark is of a grey-reddish colour, and its surface is roughish and hairy. The flowers, according to Sonnerat, are small, and at the bottom of each seed

is found a spongy substance, which seems to occupy the place of another abortive seed.

Whether this tree be of the same genus with the calambac or agallochum of the ancients, it is not easy positively to ascertain; but it agrees with the description given of it by Kämpfer.

The various names and accounts given of it are so very different, as well as the specimens of it common in our shops, that it does not seem to be properly known amongst us.

ALONSOA (named by the authors of the Flora Peruviana; after Zanoni Alonso, at the time of the publication of that work, Spanish secretary for the kingdom of Santa Fe, and a great patron of objects connected with natural history.

Class 14, 2. Didynamia Angiospermia. Nat. Ord. Solanææ.

The Characters are—*Calyx five-parted; corolla subrotate, resupinate, five-lobed, with the upper segment largest; stamens declinate; filaments smooth; anthers approximating, similar; capsule two-celled.*

1. ALONSOA ACUTIFOLIA (acute-leaved Alonsoa). *Leaves ovate, lanceolate, deeply serrated.*—An ornamental evergreen green-house shrub, three feet high, with scarlet flowers, which are produced from May to October. A native of Peru. Increased by cuttings, in loam and peat. Introduced 1790.

2. ALONSOA INCISIFOLIA (nettle-leaved Alonsoa). Bot. mag. t. 417. *Leaves ovate, acute, cut-serrate.*—The extreme brilliancy of its flowers renders this species a very ornamental plant. It is more hardy than the *A. linearis*, and a much stronger plant; in the open ground it will grow to the height of several feet. It flowers and seeds during most of the summer; is readily raised from cuttings, as well as from seeds. A native of Chili. Introduced 1795.

3. ALONSOA INTERMEDIA (intermediate Alonsoa). Bot. cab. t. 1456.—This genus is originally from Chili and Peru. The present plant is supposed to be a mule, between the *incisifolia* and *linearis*. It has been long cultivated, and is a very beautiful green-house plant, perpetually flowering. It may be increased without difficulty by cuttings, and should be potted in light loam.

4. ALONSOA LINEARIS (linear-leaved Alonsoa). Bot. mag. t. 210. *Leaves ternate, remotely tooth-tipped.* The blossoms while in bud, fold up somewhat in the same manner as those of the *Celsia*, (to which genus this plant was first referred by Professor Ortega) but on expansion they appear widely different; their shape indeed then becomes truly singular, resembling a half formed corolla; its filaments are short, and wants the hairs which in part characterise the *Celsia*; its seed vessels also are far from being round; its antheræ are large and close together, somewhat like those of the *Solanum*, and there is so little of inequality in them, that few students would be induced to refer its flowers to the class Didynamia. Its leaves, which are not deciduous, are linear, and more or less toothed, growing three together; this character, however, is somewhat obscured by others growing from their bosom.

It will succeed very well if treated as a tender green-house plant. It produces its scarlet blossoms in the latter Summer months; these are succeeded by seed-vessels, producing perfect seeds, by which, as well as by cutting, the plant is propagated. A native of Peru. Introduced 1790.

5. ALONSOA CAULIALATA (wing-stemmed Alonsoa). *Leaves ovate, acute, serrated; stem winged at angles.*—An evergreen herbaceous plant, three feet high, with scarlet flowers. A native of Chili. Introduced 1823.

Sweet says "Alonsoa is a pretty genus of easy culture, thriving well in any rich light soil, and is readily increased by seeds or cuttings."

ALOPECURUS (From Αλωπηξ, a fox, and ορα, a tail.)

Class 3, 2. Triandria Digynia. Nat. Ord. Gramina or grasses.

The Characters are—*Glume two-valved, one-flowered; valves somewhat equal, connate, distinct; paleæ united into a bladder like glume split on one side, below the middle, generally bearded; scales linear, entire; spike compound, contracted, without involucre, branches very small, branching.*

1. ALOPECURUS INDICUS (Indian fox-tail grass). *Spikes cylindrical, involucre, setaceous, fasciculate, two-flowered, peduncles villous.*—A native of the East Indies.

2. ALOPECURUS BULBOSUS (bulbous fox-tail grass). Eng. Bot. t. 1249. *Culm erect, spike cylindrical, (very simple, attenuated, smooth, glumes of the calyx, distinct and villous, Smith) root bulbous.*—The bulbous caespitose root emits fibres from its lower part, and has a brown tunicated membrane; the culm is solitary, scarcely a foot long, very simple, erect, a little decumbent at the base, foliose, binodial, striated, and smooth; the leaves smooth; the radical few and short; the cauline almost linear, patent, and of the length of the sheaths: the stipula short and striated; the spike sesquiuinal, somewhat erect, very simple, slender, acute, and many-flowered; the glumes of the calyx a little unequal, acute, awnless, altogether separate at the base, villous in the nerves, and undilated carina; the glume of the corolla emarginated and awned at the base.—This species is very different from the *A. geniculatus*, and has florets, says Dr. Stokes, longer, narrower, and much less hairy; and Dr. Smith observes, that in its spike, and the structure of the flowers, it is more nearly allied to the *A. agrestis*. It is found rarely in salt marshes; in those near Yarmouth, in the marshes of Cardiff in Glamorganshire, and near the Aust passage, and in the vicinity of Northfleet, in Kent. It is perennial, and flowers in July.

3. ALOPECURUS PRATENSIS (meadow fox-tail grass). Eng. Bot. 759. *Stem erect, smooth; panicle subspiked, cylindrical, obtuse, thick; glumes fringed, connate below the middle.*—Root fibrous; culm two feet high, erect, foliate, smooth; leaves somewhat smooth and glaucous, with a short, subpubescent stipula; spike somewhat simple, scarcely paniculated, dense, erect, about two inches long, soft, and many-flowered; all the glumes are equal, lanceolate, compressed, white, marked on both sides with two green longitudinal lines; those of the calyx, especially near the keel, silky-villous and awnless; the glume of the corolla smooth, except toward the apex of the keel, awned at the base, the awn geniculated, twice longer than the flower, and naked. This is a native of most parts of Europe, from Italy through France, Germany, Holland, Great Britain, to Denmark, Norway, Sweden, and Russia; and also in Siberia. It is found with us very

common in pastures and meadows. It is perennial, and flowers in May. *This is the best grass to be sown in low meadow grounds, or in boggy places which have been drained.* Sheep, horses, and goats eat it; but Dr. Pulteney says, this is the most grateful of all the grasses to cattle.

To distinguish this grass at first sight by its oblong, cylindrical, thick, somewhat silky and grayish spikes, is not very difficult. It may with botanical certainty be known by the lanceolate (not abrupt) calyx, containing only one flower, whose corolla consists of a *single glume* or husk, the character of the genus. Its smooth stem, short stipule, and the silky down which clothes the glumes, added to its much thicker somewhat compound spike and perennial root, distinguish it from *A. agrestis*, the only species besides that has the glumes of the calyx united at their base.

It possesses, says Professor Martyn, the three great requisites of quantity, quality, and earliness, in a degree superior to any other, and is therefore highly deserving of cultivation in lands that are proper for it. The seed may be easily collected, as it does not quit the chaff, and the spikes are very prolific. But the larvæ of a species of muscæ, which are themselves the prey of the *cimex campestris*, devour the seed so much, that in many spikes you will scarcely find one perfect. Lewis Majendie, Esq., at Hedingham, has cultivated it on a considerable scale, and found it to be an excellent grass. At Woburn the produce was nearly three-fourths greater from a clayey loam than from a sandy soil, and the grass from the latter was of comparatively less value in the proportion of four to six. The value of the grass of the latter math, considerably exceed that of the crop at the time of first flowering.

4. *ALOPECURUS AGRESTIS* (slender fox-tail grass). Eng. Bot. 848. *Stem generally erect, roughish upwards; panicle spiked, cylindrical, acute; glumes connate below the middle.*—The root is fibrous and small: the *culm* a foot and half long, erect, foliose, naked at the apex, and roughish; the *leaves* rough above, the *stipula* lanceolate and pubescent; the *spike* almost three

inches long, erect, slender, acute, many flowered, and of a purplish colour; the *glumes* subequal, larger than the preceding, and less pubescent, varied with white and green, and nerves prominent; *those of the calyx* villous at the base, connate, with a dilated subpubescent keel, and awnless; the *glume of the corolla* smooth, awned at the base; the awn geniculated, twice longer than the flower, rough and recurved in drying.

This grass differs very materially from the *A. pratensis*, for as that by its perennial situation in meadows and pastures, and excellent qualities for fodder, may be esteemed one of the most valuable; this on the contrary is rather to be reckoned as a troublesome weed, exhausting the strength of arable land to no purpose; and among wheat it it execrated by the farmers, under the name of *black-bent*; it is also common by way-sides as well as in corn-fields, and in pastures in the Isle of Wight. It has acquired the name of mouse-tail grass in English, and *Myosuroides* in Latin, from the great length and slenderness of the spike, which resembles the tail of a mouse. It is annual, flowers in July, continues flowering till Autumn, and comes into bloom very soon after being sown. There is a variety, with a shorter spike, and recurved awns. It is small and brown, on account of its barren and sunny situation.

5. *ALOPECURUS GENICULATUS* (flattening fox-tail grass). Eng. Bot. t. 1250. *Culm ascending and geniculated or knee-jointed, spike sublobate and cylindrical, glumes blunted and hairy.*—The root consists of very long and simple fibres; the *culms* natant, very long, geniculated, radicating in the inferior geniculi, assurgent in the apex, foliose, ramous, and smooth; the *leaves* smoothish; the *stipula* whitish and very slender; the *spike* cylindric, short, somewhat obtuse, divisible in lobes, many-flowered, purplish, and in the variety β whitish; the *glumes* twice less than the preceding, subequal, and very obtuse; *those of the calyx* longer, hairy; *those of the corolla* crenated, smooth, awned towards the base, the awn geniculated, and of various length. The root in dry places is bulbous, with a culm somewhat erect; and this variety Hudson has confounded with the
G G

A. bulbosus. Dr Smith mentions two varieties, viz. β . *g. fluviatile album* of Dillenius, and γ . with a bulbous root, of Hudson and Withering.

This species is easily known in its common state, by pools and in wet meadows, by the frequent joints of the culm or stem changing their direction, and appearing broken. It often puts out roots under water from the joints, and thus spreads itself; the leaves floating on the surface. From the deep colour of the spikes, it is called in some places *black-grass*. It sometimes occurs in dry pastures, and then, according to Mr. Curtis, grows more upright; the spike is much more slender, and the base of the stalk swells out into a kind of bulb. It is perennial, and flowers in July. Cattle eat it, but it is not esteemed a profitable grass. The variety γ is found on walls and a dry sterile soil. Dr. Withering mentions four varieties; one of which, with awns, very fine and soft, not longer than the calyx, fruit little, stalks branched, a fibrous root, and found in a marshy place near the Stews, in Edgbaston park, he suspects to be a distinct species.

6. ALOPECURUS HORDEIFORMIS (barley-like fox-tail grass). *Raceme simple, flowers intrenched with awns.*—This is an Indian grass, and resembles *Hordeum murinum*, or barley-grass. The height is about a foot; the leaves are flat and channelled, often longer than the culm.

7. ALOPECURUS MONSPELIENSIS (bearded fox-tail *g.*) *Panicle subspiked, calyces rugged; corollas awned.*—This resembles *A. paniceus*, but is three times as large; the calyx has a tubercle at the bottom; the corolla; which has two valves, is shorter than the awn, the culm and leaves are stiff, the glumes rough, but smooth at the edge, both valves are awned, and the awns of the corolla are much shorter than those of the calyx. It grows wild in marshes and wet pastures, at Purfleet in Essex, and at Drayton, about two miles from Portsmouth. Is annual, and flowers in June and July. It is the *A. Aristatus* of Hudson, and *Phleum crinatum* of Schreber.

8. ALOPECURUS PANICEUS (hairy fox-tail grass). *Panicle subspiked, glumes villous, corollas awned.*—It very much resembles the last species, but the whole plant is soft, and only five or

six inches high; the glumes downy, woolly at the edges; the awns of the corolla shorter than those of the calyx; the corolla has two valves, as short again as the calyx, hollow and smooth; the outer three times as broad as the other, roundish-ovate, blunt, with four teeth, with awn longer than the valve issuing from below the point; inner valve ovate-lanceolate, pointed, with two teeth; the calyx ending at the base in a hard tubercle. This species grows on dry soils, is annual, and flowers in July.

9. ALOPECURUS FULVUS (orange-spiked fox-tail grass). Eng. Bot. t. 1467. *Stem ascending, knee jointed; spike compound, cylindrical; glumes obtuse fringed; anthers orange-coloured.* It grows floating in the water like the *A. geniculatus*, but it is at first sight very conspicuous on account of the length of its spike, and rich deep orange colour of its antheræ; indeed, the form of them must be considered as its most essential character, as their colour affords its most striking indication at a distance. They are very short, thick, and almost round, deeply cloven at each end, bursting by an oval orifice at each side. The general habit of the plant is much like that of *A. geniculatus*, but larger, and the spike more compound.

10. ALOPECURUS ALPINUS (Alpine fox-tail grass). Eng. Bot. t. 1126. *Stem erect, smooth; spike ovate; glumes of the calyx downy, without awns, and nearly as long as the awns of the corolla.*—It has a creeping perennial blackish root, with many long fibres. Stem about a foot high. Radical leaves narrow; those on the stem broader, short, flat, sharp-pointed, smooth, with long and slightly inflated sheaths, crowned by very short stipulæ. Spike scarcely an inch long, lobed. Found by Mr. G. Don, growing on mountains about Loch Nagore, in Aberdeenshire.

11. ALOPECURUS CAPENSIS (Cape fox-tail grass). *Spike cylindrical; glumes smooth, awnless.*—A native of the Cape of Good Hope.

12. ALOPECURUS UTRICULATUS (bladder fox-tail grass). Flor. Græc. t. 63. *Stem ascending; raceme spiked, ovate, oblong; glumes, with a hairy keel beyond the middle, dilated; upper sheath inflated.* A native of Italy and

Greece; annual. Flowers in May and June. Introduced 1777.

13. *ALOPECURUS GIESEKEANUS* (Giesseke's fox-tail grass). Fl. Dan. t. 1565. *Stem ascending, panicle spiked, ovate; glumes woolly, acute*.—A native of the north of Europe. Introduced 1828. For propagation and culture, see GRASS.

ALOYSIA (named by Don Antonio Pala, author of an excellent translation of Linnæus's species plantarum into Spanish, after her Majesty Maria Louisa, Queen of Spain, and mother of the late Ferdinand the 7th.)

Class 14. 2. *Didynamia Angiospermia*.

Nat. Ord. *Verbenaceæ*.

The Characters are,—*Calyx deeply four-cleft; corolla tubular, four-lobed; stigma emarginate; stamens four, perfect; seeds two*.

ALOYSIA CITRIODORA (lemon scented Aloysia). Bot. mag. t. 367. *Stem shrubby; leaves linear, lanceolate, ternate*. The leaves (or any part of the plant) when bruised, give out a most delightful fragrance; on this account, it is a most valuable acquisition to our gardens; it forms a shrub of a considerable size; the leaves, as far as we have noticed, always grow three together; the veins on each side of the midrib, run parallel to each other; the flowers are small, nearly white, forming a panicle; they are produced during most of the summer and autumn months.

This shrub, being easily propagated by cuttings, is now become common in the neighbourhood of London, where it is treated as a greenhouse plant, and grows freely in light rich soil. A native of Chili. Introduced 1784.

ALPINIA (after Prosper Alpini, an Italian physician and botanist, who practised at Cairo, between 1580 and 1584, and died 1615).

Class 1. I. *Monandria Monogynia*.

Nat. Ord. *Scitamineæ*.

The Characters are,—*Anther not crowned; interior limb of the corolla with one lip; capsule berried; seeds with an arillus*.

1. *ALPINIA ALLUGHAS* (Ceylon Alpinia). Bot. rep. 501. *Nectary two-leaved; lobes retuse; leaves lanceolar, polished; panicle terminal; capsules spherical, polished (black) one-valved many seeded*. Sir W. Jones gives the following description of this plant. *Interior*

border of the corolla pink and white; under lip, internally milk white, with a rich carmine stripe in each of its divisions. Seeds aromatic, hotter than Cardamons. Leaves alternate, sheathing, oblong, pointed, keeled, most entire, margined, bright grass green above, very smooth; pale sea-green below. Stem compressed, three or four feet long, bright pink near its base; erect, ending in a beautiful panicle. Peduncles many flowered; bractes few, lance-linear very long, withering. Root fibrous, with two or three bulbous knobs, light brown and spongy within, faintly aromatic.

A native of Bengal, where it is very common; flowering the whole of the rainy season. The seed becomes ripe in October and November. Introduced 1796.

2. *ALPINIA RACEMOSA* (clustered Alpinia). Rum. i. c. II. t. 20). *Lip trifid; leaves ovate-lanceolate, apex revolute; capsule striated*.—In this species the root is fleshy, branched, having the smell and taste of ginger. *Stem* from two to five feet in height, herbaceous, round, smooth, leafy. *Leaves* sheathing at the base, alternate, lanceolate-ovate, smooth and even, quite entire, with transverse nerves. *Raceme* erect, coloured, shining. *Bractes* alternate, lanceolate, acuminate, almost the length of the flowers, blood-red. *Flowers* on very short peduncles, one or two between the bractes. *Calyx* somewhat bell-shaped, red; the teeth obsolete, truncate. *Corolla* white; tube longer than the calyx; parts of the border erect. *Nectary* longer than the corolla, ventricose at the base; the lower lip broader, convex at the tip, three-parted, the middle part emarginate. *Filament* or upper lip of the nectary short, involved in the lower lip, embracing it with a toothlet at the sides. *Germ* three-cornered; the upper part of the style concealed within the channelled anther; *stigma* subcapitate, emarginate. *Capsule* inferior, roundish, with three blunt corners. *Seeds* shining.

Native of the West Indies; flowering from July to September. Introduced 1752.

Being a native of hot climates, it must be preserved in a stove, and the pot plunged into a tub of water. The leaves decay every winter, and are pushed out from the roots every spring;

like the *Maranta*. It may be increased by parting the roots, when the leaves decay.

3. *ALPINIA GALANGA* (loose-flowered *Alpinia*). Ru. Amb. t. 63. *Leaves sessile, broad, lanceolate; panicle terminal; lip oblong, anguiculated, bifid; capsule obovate, smooth; seeds few*.—A native of the Malay Archipelago, where they flower during the hot season, and ripen their seed, though very rarely in November. The seed vessel is small, and of a deep orange-red colour; it does not open spontaneously, and generally contains about two seeds in each cell, which are three-fourths covered with a white aril. To the taste they are bitter and naseous.

The root of this plant was ascertained by Sir Joseph Blanks and Dr. Combe to be the true *Galanga major* of the druggists. In the East Indies, these roots are used by way of spice. They were formerly in common use as a warm stomachic bitter, and generally made an ingredient in bitter infusions; but they are now almost wholly laid aside, on account of their unpleasant flavour. Bitterness does not appear to be the proper medical character of this root: the heat and pungency greatly prevailing.

4. *ALPINIA MALACCENSIS* (woolly-leaved *Alpinia*). Bot. reg. t. 328. *Leaves lanceolate, petioled, villous underneath; raceme terminal, simple; lip broader than long, obscurely three-lobed; lateral lobes, incurved into a tube*. This is the most stately and most beautiful of all the scitamineous plants of India. The flowers are particularly large, with the bractes, and exterior border of the corolla, pure, smooth, lucid white; and the large lip variegated with crimson and yellow. The stem is simple, upright, round and covered by the sheaths of the foliage; from five to eight feet high. The leaves are two feet long, furnished with very numerous fine nerves, which converge at an acute angle. A native of the East Indies. Introduced 1799.

5. *ALPINIA NUTANS* (nodding-flowered *Alpinia*). Bot. mag. t. 1903. *Leaves lanceolate, small; racemes compound, drooping; lip broad, three-lobed; lateral incurved into a tube; external curled and bifid; capsules spherical, opening down the sides; seeds few; aril white*.—The *Alpinia nutans* is one

of the most stately and beautiful of its order, growing in Amboyna and other parts of the East Indies, and flowering in our stoves about June or July. The roots are perennial, tuberous, forming many offsets. Stems from twelve to eighteen feet high, perennial, upright, straight, simple, leafy. Leaves alternate, lanceolate, each with a sheathing footstalk, crowned with an obtuse stipula, silky externally. Cluster terminal, pendulous, hairy, branched in the lower part, the branches short. Flowers drooping, inodorous, very richly coloured. Bractes solitary under each flower, elliptical, inflated, jagged, and sometimes hairy at the tip, of a pure white, tinged with pink, having all the brilliancy of the finest porcelain. Calyx white, of one leaf, irregularly torn, crowning the germen. Outer corolla coloured and polished like the bractea, tubular, its limb in two lips; the uppermost undivided, broad, and concave; the undermost in two narrower lobes: inner corolla of one lip, large, thick, concave, obscurely three-lobed; yellow, beautifully stained and streaked with crimson; its margin irregularly crisped and notched; its base bearing a pair of awl-shaped teeth. Stamen glandular at the base, short and thick, bearing a two-lobed, thick, vertical anthera, without any appendage or dilation beyond it. Style, thread-shaped, as long as the stamen and anthera, and embraced by the lobes of the latter. Stigma peltate, hairy, somewhat triangular. Germen clothed with long soft hairs, three-celled. Seeds round. The seeds possess a small degree of spicy warmth. The root is also odorous, and is sometimes sent from the Indies to England for *Galanga major*. Introduced 1792.

6. *ALPINIA CERNUA* (drooping *Alpinia*). Bot. mag. t. 1900. *Racemes terminal drooping; lip bifid; leaves lanceolate, acuminate; margins rough, with little spinous teeth*.—*Alpinia cernua* is smaller in all its parts than *nutans*, to which it is very closely allied. The leaves are lanceolate, smooth, with oblique parallel veins; margin irregularly toothed, with small spinescent teeth, apex, elongated, linear; petiole sheathing, with a dark coloured stipular process or ligula. Inflorescence a terminal compound raceme; common peduncle cernuous, villous articulate; partial

peduncle very short, villous, one, two, or three-flowered. *Bractes* boat-shaped, membranaceous subdiaphanous, smaller than the flower deciduous. *Calyx* tubular, three-toothed, mouth oblique. *Corolla* having the three outer laciniae, equal, shining ivory white, connected at the base into a curved tube; inner laciniae unequal, consisting chiefly of one large *nectarium*, oblong, somewhat boat-shaped, beautifully streaked, with red and orange; *apex* purple, curled, bifid. *Filaments* nearly the length of the nectarium. *Germen* villous; *style* the length of the filament, in the dorsal groove of which it is concealed. *Stigma* funnel-shaped, fringed with hair. Native of the East Indies. Flowers in June. Propagated by suckers. Introduced 1790.

7. *ALPINIA MUTICA* (spurless *Alpinia*). Rosc. scitam. t. 69. *Racemes* terminal, erect, compound; *Lip* three-lobed, no spur; *capsule* berried; *leaves* narrow, shining.—A native of the Prince of Wales's Island, where it flowers more or less the whole year, but chiefly during the hot season. It is also an elegant species, and holds a middle rank between *nutans* and *calcarata*. Introduced 1811. Flowers in August.

8. *ALPINIA CALCARATA* (upright-spiked *Alpinia*). Bot. rep. 421. *Leaves* linear, lanceolate, polished; *spike* compound, erect; *lip* ovate-oblong; *apex* curled and bifid.—This elegant plant was first flowered in this country by A. B. Lambert, Esq. who informs us that it had grown vigorously to the height of about three feet in the bark bed of his hot-house, without showing flowers; but that on being removed from the tan and placed upon the flue, it soon produced them; whence it is probable that the check to its growth, occasioned by the mere change of situation, was the cause of its blooming, as in other collections it had not hitherto done it. Dr. Roxburgh informs us that "From China it was introduced into his garden (Calcutta) in 1799, where the same root quickly produced innumerable stems of about the thickness of a common *ratan*, and about three or four feet long; and in flower more or less the whole year, but chiefly in March and April." Introduced 1800. Flowers in September.

9. *ALPINIA SPICATA* (spicked *Alpinia*). *Spike* terminal, oblong, com-

actly imbricated, with narrow sharp *bractes*. Dr. Roxburgh says that this species is "a native of Sumatra, and the smallest of the genus I have yet seen. It was brought to my garden from Bencoolen, in 1803; and at the close of the rains of 1808, it blossomed for the first time and was then only about two feet high." Introduced 1822.

10. *ALPINIA OCCIDENTALIS* (occidental *Alpinia*). *Raceme* radical, compound, erect; *nectary* emarginate; *capsules* three-celled; *leaves* lanceolate-ovate, very smooth.—A native of Jamaica; six feet in height. Introduced 1793.

11. *ALPINIA MAGNIFICA* (magnificent *Alpinia*). Rose sc. t. 75. *Scape* lateral; *flowers* aggregate, numerous (50—100) on a common receptacle; *lip* narrow, linear, ovate at the apex, scarlet, bordered with white; *filament* and *style* downy—This very singular and magnificent species of *Alpinia*, is a native of the Mauritius, surpassing in the splendour of its appearance every other of the tribe hitherto known. Introduced 1826.

Sweet observes, "*Alpinia* is a splendid genus, and easily cultivated. Its species require rich soil, and to be grown in large pots in a moist heat, and they will flower freely. Few cultivators allow them room enough, which is the reason we so seldom see them flower. Several handsome species are now in the collections; they are readily increased by dividing at the root.

ALSINE.

Class 5, 3. *Pentandria Trigynia*. Nat. Ord. of *Carophylli*.

The Characters are—*Calyx*, a five-leaved perianthium, leaflets concave, oblong and acuminate; *corolla* has five equal petals, longer than the calyx; *stamina* consist of capillary filaments, anthers roundish; *pistillum* a subovate germ, styles filiform, stigmas obtuse; *pericarpium* an ovate, one-celled, three-valved capsule, covered with the calyx; seeds very many and roundish.

1. *ALSINE MEDIA* (common chick-weed). Curtis, lond. 1, 20. *Petals* bipartite, *leaves* ovate-cordate.—Common chick-weed is so generally known, that it seems scarcely necessary to describe it; we may observe the number of stamens in the flower is very uncertain; from three to ten. This species in different soils and situations assumes

different appearances; but it is distinguished from the *Cerastium*, which it most resembles, by the number of pistils, and by having the petals shorter than the leaves of the calyx, and from all the plants related to it, and particularly the *Stellaria nemorum*, by having the stalk alternately hairy on one side only. Dr. Withering and Sir J. E. Smith refer it to the *STELLARIA*, with which genus it agrees in various respects, and especially in the capsules opening with six valves. He observes, that it grows almost in all situations, from damp and almost boggy woods, to the driest gravel walks in gardens; but in these various states its appearances are very different, so that those who have only taken notice of it as garden-chicken-weed would hardly know it in woods, where it sometimes exceeds half a yard in height, and has leaves near two inches long, and more than one inch broad. In its truly wild state, he says, in damp woods, and hedge bottoms with a northern aspect, it has almost always ten stamens; but in drier soils and more sunny exposures, the stamens are usually five or three. When the flowers first open, the peduncles are upright; as the flowers go off, they hang down; and when the seeds ripen, they again become upright. Dr. Withering observes, that the flowers are upright, and open from nine in the morning till noon; but if it rains, they do not open. After rain they become pendent; but in the course of a few days, rise again. In gardens or dung-hills chick-weed sheds abundance of seeds, which are round, compressed, yellow and rough, with little tubercles and thus becomes a troublesome weed; but if it be not suffered to seed, it may be destroyed, as it is annual, without much trouble.

This species is a remarkable instance of the sleep of plants; for every night the leaves approach in pairs, including within their upper surfaces the tender rudiments of the new shoots; and the uppermost pair but one, at the end of the stalk, is furnished with longer leaf-stalks than the others, so that they can close upon the terminating pair, and protect the end of the branch. The young shoots and leaves, when boiled, can scarcely be distinguished from Spring spinach, and are equally wholesome. Swine are very fond of it; cows

and horses eat it; sheep are indifferent to it; and goats refuse it. It is a grateful food to small birds and young chickens. *For medical purposes* this herb was formerly employed in cataplasms against inflammations; and its expressed juice, or decoction, given also internally, as an aperient, antiscorbutic, antiphlogistic; and as a restorative, probably for abating hectic heats, in atrophies and consumptions. *The virtues ascribed to it*, says Dr. Lewis, do not appear to be wholly without foundation; though its active matter is so far divided and diluted in the herb, as scarcely to manifest itself till separated from the grosser parts. This plant is found wild in most parts of the world. It flowers almost through the whole year.

2. *ALSINE SEGETALIS* (corn chick-weed). *Petals entire, leaves awl-shaped.* It is annual, and grows about Paris and in Piedmont. Flowers from July to September. Introduced 1805.

3. *ALSINE MUCRONATA* (bristly chick-weed). *Petals entire, short; leaves setaceous; calyxes awned.*—Stems erect, a foot high, many together, branching, a little hairy. *Leaves* much more slender than the other species, long, and very sharp pointed, yet with broad connate bases. *Flowers* in young plants, from the axils, in full grown ones in a sort of umbel. *Calyxes* marked with lines, and ending in a prickle. *Petals* ovate, white. Native of France and Switzerland. Introduced in 1777, by A. Gouan, M. D.

ALSTROMERIA (so named from Baron C. Alström, of Sweden, who, in his travels through Europe, sent many plants to Linnæus).

Class 6, 1. Hexandria Monogynia. Nat. Ord. *Amarylhideæ*.

The Characters are—*Sepals* 6, campanulate or two-tipped, the two lower half tubular at the base; *stamens* declinate or erect; *stigmas* 3, linear; *capsule* roundish-oval, 3-6 angular, three-valved, or pulpy within, and not opening.

1. *ALSTROMERIA PELEGRINA* (spotted flower Alströmmeria). Bot. Mag. t. 139. *Stem* erect; *corolla* spreading; *three outer sepals* wedge-shaped, *three toothed*; *leaves* linear, lanceolate, sessile.—A native of Peru, growing wild near Lima: it has been long cultivated in this country, and is a plant of great

beauty. The flowers are whitish, most beautifully stained and veined with purple and red. It requires the green-house, and great care should be taken to save its young shoots from the slugs, which are unusually greedy of them.

It flowers during the greater part of the Summer, and often produces seeds here: it may also be increased by separating the roots in the Autumn, at which season the stems decay and are succeeded by new ones. The soil should be loam, peat, and rotten dung in equal proportions. Introduced in 1753, by Messrs. Kennedy and Lee.

2. *ALSTŒMERIA LIQTU* (striped flowered *Alstrœmeria*). Bot. mag. t. 125. *Stem erect; peduncles of the umbel longer than the involucre; corolla two-tipped.*—The barren stems are clothed with awl-shaped leaves, and terminated with spatulate-oblong leaves, placed in a kind of rose; the *floriferous stem* clothed with awl-shaped leaves, the *peduncles* few and naked; the three upper petals of the corolla larger, white, dotted at the base, and spotted at the tip with red, the three lower ones shorter and red; the *filaments* longer than the lower petals, rugged, the *anthers* twin and yellow; the *pistil* red. This plant, which is a native of Lima, is remarkable for the largeness of its flowers, and for their fragrance, scarcely inferior to mignonne; it flowers in February and March, and was introduced here about 1776 by John Brown, Esq.

Messrs. Loddiges say that "this charming plant requires a pretty good heat, and is highly deserving a place in every stove. We have frequently had it begin to blow in October, and continue throwing up new flower stems until March or April; the blossoms are delicately fragrant. Both this and the other species (so far as we are acquainted with them) have the singular property of the leaves being all resupinate: there is a twist in the petiole, which reverses every leaf, turning the under side upwards. At a little distance this is not observable, as the under part assumes all the character of the outside. It is propagated by dividing the roots in spring; soil, loam and peat."

3. *ALSTŒMERIA SALSILLA* (eatable rooted *Alstrœmeria*). Bot. Mag. t. 1613. *Stem twining; leaves lanceolate, acuminate; umbel branching.*—The leaves are nervose; *petioles* naked; the invo-

lucre many-leaved, awl-shaped and reflex; the *peduncles* few, elongated, sustaining one or two flowers, the outer petals red, and the inner greenish. This elegant climbing plant is a native of South America, and St. Domingo, growing in shady places, and twining round other plants; its tuberous roots are said to be eaten as potatoes.

With us it requires the stove, and should be potted in light rich earth, composed of one half rotten dung, and the rest loam and peat. The stems come up in Spring, and will run nearly ten feet in height, producing many flowers, which last a long time. After flowering the stems decay. The roots may be divided in the Spring, and thereby sparingly increased. Introduced 1806.

4. *ALSTŒMERIA PULCHELLA* (red-flowered *Alstrœmeria*). Swt. br. fl. gar. t. 267. *Stem weak; leaves spatulate, ciliated; umbel many-flowered; peduncles two-flowered.*—This plant resembles the former in its structure and habit, but the leaves are narrower, and the stem terminated by an irregular involucre of larger petiolate leaves; the *peduncles* naked and one-flowered, flowers four or six rather nodding; the petals alternately less, whitish, red at the tip, streaked, or dotted with red at the base; *filaments* yellow, *pistil* red, and *stigma* trifid. A native of Chili; flowering during the months of May and June. Messrs. Loddiges recommends that "it should be kept in a green-house," and says "that it thrives best in large sized pots, and in a mixture of peat earth, loam, and rotten dung, in equal proportions; the stems were three or four feet in height, and the flowers exquisitely beautiful." Mr. Sweet observes, "A plant of it has stood well in my garden for several years, without any protection, where it thrives well, and grows more stout and robust, but not near so tall, as when drawn up in a green-house; but it requires to be well watched, that the snails and slugs do not devour it, as they are particularly fond of it, and of the whole of this genus. It should be planted full six inches deep; and in very severe frost, if covered with a little hay or straw, it will be more safe." Introduced 1822.

5. *ALSTŒMERIA OVATA* (oval-leaved *Alstrœmeria*). Bot. Cab. t. 1054. *Leaves lanceolate, lanuginose on the*

upper surface, lucid on the lower.—The stem, twining contrary to the sun, is slender, and three feet high; the leaves are alternate and sessile; the flowers terminate in umbels; the petals approximate into a tube, ovate-oblong, the three outer scarlet, green at the tip, the three inner green, flattened towards the top, and variegated with black dots; the stamens are fixed to the germ near the base of the petals, anthers ovate and brown; germ green without, marked with six longitudinal grooves, and terminated with six small notches; style subulate, stigmas sharp, capsule globular, an inch in diameter, six-grooved, six-notched at the edge. This species differs from the former in its woolly leaves, and tubulose flowers.

It is a herbaceous climbing plant, growing to the height of six feet or more during the Summer, and flowering from July till late in Autumn. It is usually kept in a green-house, but Messrs. Loddiges say "We have found it live very well in a warm border during the severe winter of 1829. It may be increased by dividing the roots, and should be planted in rich well manured soil." It is a native of Chili and Peru. Introduced 1824.

6. *ALSTROEMERIA PSITTACINA* (parrot-like *Alstroemeria*). Sweet. t. 15, n. s.—Stems short, erect, but flexuose, glabrous, some of them sterile, with a crown of broadly oblong, spathulate twisted leaves; others taller, with distant, scattered, linear-oblong, twisted leaves, attenuated at the base, all of them obtuse. Umbel terminal, of from four to six flowers, surmounted by an involucre of four or five leaves, similar to those of the stem, but smaller. Peduncles angular, unbranched. Corolla subcampanulate, of six linear-spathulate, shortly acuminate petals, of a beautiful red colour, green at the apex, and there only marked, both within and without, with small oblong brown spots, the three inner spots narrower than the rest. Filaments slender, glabrous, pale rose-coloured; anthers oblong, green; germen inferior, turbinate, angled; style as long as the stamens, slender; stigma trifid.

This elegant plant is a native of Mexico; it was sent to this country by Professor Lehmann, from the Edinburgh Botanic Garden, in which we understand it was first raised. It grows

about two feet high, and flowers in July and August. It appears to be more tender than the Peruvian species, requiring constant protection in a warm green-house, and may be increased by seeds, (which will come to perfection here,) or by separating the roots after the stems decay. The soil should be peat, loam, and rotten dung, in equal proportion; the pots large.

7. *ALSTROEMERIA HIRTELLA* (hair-leaved *Alstroemeria*). Sw. t. 222. Roots perennial, tuberous, resembling small potatoes; stem simple, twining, four feet high.—The leaves alternate, ovately-lanceolate, many-nerved; umbel terminal, many-flowered; peduncles two or three flowered; bracts sessile; pedicels triangular, sulcate; perianthium petal-like, deeply six-parted; stamens 6; style short; stigma trifid; capsule narrow at the base, and broad at the end, three-celled, many-seeded; seeds about the size of small peas.

This handsome plant is a native of Mexico, and is (according to Sweet) quite hardy. The outer segments of the perianthium are on the outside, of a pale orange colour, tinged with red, green near the point, inside rather paler. The inner segments are strongly keeled at the back, which is of a green colour; inside green, elegantly spotted and striped with dark purple. It requires to be planted about six inches deep, in a light sandy soil. Introduced 1824.

8. *ALSTROEMERIA FLOS MARTINI* (St. Martin's *Alstroemeria*). Bot. reg. t. 731. Stem erect; leaves linear lanceolate; flower-stalks twisted; outer sepals obcordate, mucronate. A native of Chili, where it is known by the appellation of "*Flor de San Martin*." It grows to about two feet in height, and produces its flowers, which are very elegant, in May and June. The seed sometimes ripens in this country.

It requires to be placed in the green-house, and should be planted in a large pot. The soil should be loam and peat, with a proportion of very rotten dung from an old hot-bed. The root will seldom admit of separation. Introduced 1823.

9. *ALSTROEMERIA VENENATA*. Bot. Cab. 1180.—This elegant plant is a native of the East Indies. Its leaves are beautifully veined, in a transverse direction; the flowers are very delicate.

It must be preserved in the stove, and will increase by cuttings. The soil should be loam and peat. It flowered with us in the month of September."

10. *ALSTÆMERIA ACUTIFOLIA* (taper-pointed leaved *Alstrœmeria*). Sweet, t. 77. *Stem climbing, twisted; leaves oblongly-lanceolate, tapering to a long slender acute point, many nerved; umbel, many-flowered; peduncles flattened, angular.* The *perianthium* consists of six distinct leaflets, unconnected at the base, of a bright dark red on the outside, and orange within. *Stamens* six, inserted in the very base of the leaflets; *style* smooth; *stigma* three-cleft; *segments* short, spreading, pustulose. A native of Mexico, should be planted full six inches deep, in a very light sandy soil; and it may be increased by seeds, or by dividing the roots. Introduced 1830.

11. *ALSTÆMERIA ROSEA* (rose-coloured *Alstrœmeria*). Hook. ex. fl. t.

181. *Stem slender, erect; leaves linear, slightly twisted; germen inferior, turbinate, deeply furrowed.*—In this species the flowers grow in a dichotomous panicle of six nearly erect rose-coloured flowers. In the colour and markings, and perhaps, too, in the shape of the flower, it comes nearer to *A. pelegrina* than to any other known species of the genus; but in that the leaves are vastly broader and longer, and the outer segments of the perianth are obcordate, and all of them much more spreading. A native of Chili. Introduced 1822.

ALTHÆA (from *altho*, to cure, in allusion to the well-known salutary effects of *A. officinalis*).

Class 16. 7. Monadelphia Polyandria. Nat. Ord. *Malvaceæ*.

The Characters are—*Calyx* five-cleft, girded by a six or nine-cleft involucre; *carpels* capsular, one-seeded, disposed into an orbicular head.

1. *ALTHÆA OFFICINALIS* (official marsh-mallow). Eng. Bot. t. 147. *Leaves soft on each side, cordate or ovate, toothed, undivided or three-lobed; peduncles axillary, many-flowered.*—Common or official Marsh-mallow grows naturally in salt marshes, and on the banks of rivers and ditches in Cambridgeshire, Norfolk and Suffolk; on the sea shores of Cornwall; in Holland, France, Italy, Siberia, &c. It has a perennial root, and an annual

stalk, growing erect, to the height of four or five feet, and putting out a few lateral branches. The leaves are soft, angular, and alternate. The flowers are axillary, shaped like those of the Mallow, but smaller and of a pale colour. These appear in June or July, and the seeds ripen in September.

There is a variety of this (Miller, n. 2.) with the leaves rounder, and not ending in a point; and is observed to grow in the Isle of Ely. It also varies with lacinated leaves.

[The whole plant, but especially the roots, abound with a mild mucilage, which is emollient in a much greater degree than common Mallow. The root boiled is much used as an emollient cataplasm, and an infusion of it is very generally prescribed in all cases wherein mild mucilaginous substances are useful; as a pectoral, and in complaints of a gravelly nature. A favourite lozenge is named from it, *Pâte de Guimauve*. The infusion is much superior to the syrup which is kept in the shops.]

It may be propagated fast enough, either by seeds, or parting the roots. The seed should be sown in the Spring; but the best time for parting the roots is in Autumn, when the stalks decay. It will thrive in any soil or situation, but in moist places will grow larger than in dry land. The plants should not be nearer together than two feet; for the roots spread wide.

2. *ALTHÆA NARBONENSIS* (Narbonne marsh-mallow). Jacq. t. 138. *Root perennial; stem annual, hoary, branched, pubescent; leaves, lower, 5-7 parted, upper trifid; peduncles many-flowered, longer than the leaves; anthers dark purple; stigma white.* The plant grows from three to six feet in height. Flowers of a pale purple rose-colour. Native of France and of Spain; blooms in August and September. Introduced 1780.

3. *ALTHÆA HIRSUTA* (hairy marsh-mallow). *Leaves cordate, rough with hairs, smooth above, lower blunt, upper five-lobed; stem hispid.*—A low plant, with the branches trailing on the ground. Is a native of many parts of Europe, and has also been found in this country near Cobham Hall, Kent. It is about two feet in height, with very pale bluish-coloured flowers, which are produced in June and July. The stalks

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are woody, but seldom last more than two years. It is generally found under hedges.

If the seeds be sown in April, the plants will flower in July, and the seeds ripen in September. They should be sown where they are to remain, for as the roots shoot deep into the ground, they seldom survive transplanting.

[4. *ALTHÆA LUDWIGII* (Ludwig's marsh-mallow). *Leaves smooth, cordate, roundish, lobed, toothed; pedicels axillary, clustered, one-flowered.*—A native of Sicily, with white or blush-coloured flowers. Flowers June and July. Introduced 1791.]

5. *ALTHÆA CANNABINA* (hemp-leaved marsh-mallow). Jacq. aust. t. 101. *Leaves downy, hoary beneath; lower palmate; upper three-parted; lobes narrow, coarsely toothed.*—Hemp-leaved marsh-mallow has a woody stem, which rises to the height of four or five feet, and puts out many side branches. The leaves are alternate; the flowers are axillary, not so large as those of the common marsh-mallow, but of a deeper red colour, and the calyx much larger. This sort seldom flowers the first year, unless the Summer prove warm; but when the plants live through the Winter, they will flower early the following Summer, and produce good seeds. It grows naturally in Hungary, Istria, Austria, Carniola, Italy, the South of France, &c., by wood sides. Cultivated by Gerard, in 1597.

It requires a sheltered situation and dry soil, to live through the Winter, in England. When they grow in a stony soil, or in lime rubbish, they will be stunted in their growth, but will endure the cold better.

The species of this genus are small, inconspicuous plants, the seed of which will grow in any soil, and under any circumstance.

ALYXIA.

Class 5. 1. Pentandria Monogynia. Nat. Ord. *Apocineæ* Brown.

The Characters are—*Cor. hypocraterif, fauce nuda; stam. inclusa, ovaria 2, oligosperma; style sub-coherentes; stig. obtusum; drupæ 2; pedicellatæ 1; sperma 9.* (K. Brown, prod.)

ALYXIA RUSCIFOLIA.

This is a native of the northern parts of New Holland, within the tropic, according to Mr. Brown. It appears to be a small shrub with straight branches,

and rigid glossy leaves, ending in a hard point, growing in whorls of four or five each. It flowers in January, and requires to be preserved in a warm green-house. It may be increased by cuttings, is of slow growth, and ought to be potted in loam and peat soil.

ALYSSUM.

Class 15. 1. Tetradynamia Siliculosa. Nat. Ord. *Cruciferae*.

The Characters are—*Silicle orbicular or elliptical, with valves flat or convex in centre; seeds 2-4 in each cell; calyx equal at base; petals entire, some of the stamens toothed.*

1. *ALYSSUM MINIMUM* (least madwort). Tratt. thes. bot. t. 35. *Stems diffused; leaves linear, downy; petals subemarginate, yellow; silicles compressed.*—A small annual plant, growing wild in dry sandy fields and on hills in Spain, &c. Flowering in May. Introduced 1791.

2. *ALYSSUM CALYCINUM* (calycine madwort). Jacq. aust. t. 338. *Stamens all toothed; calyxes permanent; silicle four times as long as style; stems diffuse; leaves linear, lanceolate, hoary.*—Annual. Native of Austria, South of France, &c. in dry fields: flowering from May to August. Introduced 1740.

3. *ALYSSUM CAMPESTRE* (field madwort). Fl. græ. t. 626. *Stems diffuse; leaves lanceolate, or somewhat linear, hairy; pods roundish, rough, six times as long as style.*—Native of sandy fields in Spain, South of France, Greece, &c. Flowers from June to August. Introduced 1768.

4. *ALYSSUM ROSTRATUM* (beaked madwort). Stev. m. a. peterob. t. 15. *Stem erect; flowering branches, panicled; leaves lanceolate, downy; pods roundish, elliptical, little longer than the style.*—A native of the Crimea, with dark yellow flowers. It grows on the edges of fields, and on calcareous rocks, &c. Flowers from May to July. Introduced 1820.

AMADOU, the name of an inflammable substance, generally known under the name of *German tinder*, and used frequently as such in this country. It is prepared from the dried plant of the *Boletus igniarius*, steeped in a strong solution of saltpetre, and cut into thin slices.

AMARANTHUS (*incurruptible*, because the flower being cropped, does not soon wither).

Class 21. 5. Monoecia Pentandria.
Nat. Ord. *Amaranthaceae*. Brown.

The Characters are—**MALE calyx**, 3-5-leaved corolla, 0; **stamens**, 3-5; **FEMALE calyx** of the male; **corolla**, 0; **styles**, 3; **capsule** one-celled, cut round about.

1. **AMARANTHUS TRICOLOR** (three-coloured Amaranth). Kn. th. 2. t. A. 3, 6. *Clusters sessile; leaves oblong, lanceolate, coloured.*—It has been long cultivated for the beauty of its variegated leaves, which are of three colours, viz. green, yellow, and red; very elegantly mixed when the plants are in full vigour; these are large, and closely set from the bottom to the top of the stalks; the branches also form a sort of pyramid, so that there is not a more beautiful plant than this when it is in full lustre. The stem is two feet in height. Flowers from June to September. Introduced 1548.

2. **AMARANTHUS MELANCHOLICUS** (melancholy Amaranth). W. am. 15, t. 9, f. 18. *Clusters axillary, stalked, roundish; leaves ovate, lanceolate, coloured.* Grows to the same height, and in the manner of its growth greatly resembles the *tricolor*; but the leaves have only two colours, which are an obscure purple, and a bright crimson; but these are so blended as to set off each other, and when the plants are vigorous, they make a fine appearance. Introd. 1731.

AMARANTHUS TRISTIS (round-headed Amaranth). (W. am. 21, t. 5, f. 10. *Clusters spiked loosely; leaves subcordate, ovate, emarginate, shorter than petiole.*—The stem is three feet high, with an upright stalk, which sends out some lateral branches toward the top; the leaves are oval and heart-shaped. The flowers are green, and produced at the wings of the stalks in roundish spikes, as also at the extremity of the branches, but have very little beauty. The young plants of this sort are gathered to boil instead of spinach by the inhabitants of India, where it grows naturally, and from thence I received the seeds of it as an esculent plant. Flowers from June to August. Introduced 1759.

4. **AMARANTHUS CAUDATUS** (love lies bleeding Amaranth). *Racemes decomposed, pendulous; leaves lanceolate; stem nodding.*—The stem is upright, three feet high; the leaves and stalks are of a pale green colour; the spikes

of flowers are produced from the wings of the stalks, and also in clusters at the extremity of the branches: they are very long and hang downward, being of a bright purple colour: some of these spikes are two feet and a half long. Flowers in August and September. Introduced 1596.

5. **AMARANTHUS MAXIMUS** (Tree Amaranth). *Spikes pendulous, almost cylindrical; stalk erect, tree-like.*—The stem grows to the height of seven or eight feet, sending forth many horizontal branches toward the top; leaves oblong, rough, green. At the extremity of every shoot, the cylindrical spikes of a purple colour are produced, which hang downward; but these are seldom half the length of those of the *caudatus*, and are much thicker. Flowers in August. Introduced 1820.

6. **AMARANTHUS LIVIDUS** (livid Amaranth). W. am. 20, t. 1, f. 1. *Clusters somewhat spiked, rounded; leaves elliptical, retuse; stem erect, hollow, round, deeply curved.*—The stem grows near three feet high, putting out several side branches; leaves oval, blunt; at the ends of the branches the spikes are produced in clusters, and grow erect; these are of a deep purple colour. Flowers from July to September. Introduced 1759.

7. **AMARANTHUS FLAVUS** (pale Amaranth). W. am. 35, t. 3, f. 6. *Racemes compound, nodding; leaves ovate, lanceolate.*—Stem four feet high; the stalks are inclined to red; leaves of an oval spear-shaped figure, and green colour, marked with purple spots; have very long foot-stalks. The spikes come out at the extremity of the branches in clusters, as also from the wings of the stalks; these are of a pale green colour, and grow erect. Introduced 1759.

8. **AMARANTHUS BLITUM** (wild Amaranth). Eng. Bot. 2212. *Clusters somewhat spiked; flowers three-leaved; leaves ovate, retuse; stem diffuse.*—It grows naturally in most of the warm parts of Europe, and also in America; for wherever it is permitted to scatter its seeds, the plants will come up the following Summer, and become troublesome weeds. It is seldom cultivated, and only preserved in botanic gardens for the sake of variety. Native of all parts of Europe, except the very cold parts, Japan, &c.

9. **AMARANTHUS GRÆCIZANS** (pelli-

tary-leaved Amaranth). W. ama. 8, t. 4, f. 7. *Clusters axillary; flowers trifid; leaves obovate, emarginate; stem roundish, branched.*—The stem is a span high, grooved, whitish, except at the base, where it is purplish. Native of North America. Introduced 1723.

10. AMARANTHUS HYBRIDUS (clustered Amaranth). W. am. 26, t. 9, f. 17. *Raceme decomposed, clustered, erect; leaves ovate, lanceolate.*—The stem is three feet high, and sends out many side branches, which are hairy; leaves oblong, rough. The spikes are produced from the wings of the stalks, as also at the extremity of the branches, growing horizontally, and are of a green colour. It is found wild in America and Arabia Felix. Introduced 1656.

11. AMARANTHUS HYPOCONDRIACHUS (Prince's feather Amaranth). *Racemes compound, erect, clustered; leaves oblong, lanceolate, mucronate.*—It has a stem two feet in height, roundish and grooved. It varies with leaves more or less red, with very red and paler racemes, with a green and red, and a rough and smooth stalk; is now become a common weed, frequently growing upon dunghills. The plants abound with seeds, so that where they are permitted to scatter, they will come up abundantly the following Summer, and will remain in the ground several years. Introduced 1739.

12. AMARANTHUS SPINOSUS (prickly Amaranth). W. am. 38, t. 4, f. 8. *Racemes pentandrous, terminal, compound; axillæ spiny.*—It grows about two feet high, putting out many side branches, so as to form a bushy plant; the leaves are oblong, and the spikes come out at every joint, where the stalks are armed with sharp prickles, and at the extremity of the branches, the spikes are longer than those of the side: these are slender, and inclining to a brown colour. It is eaten in the East Indies, of which it is a native, as a green, boiled with *Basella cordifolia*. Introduced 1683.

13. AMARANTHUS SANGUINEUS (spreading Amaranth). W. am. 31, t. 2, f. 3. *Racemes suprade compound, erect; branches spreading, smooth; leaves oblong, acute.*—An esculent plant, bearing fine flowers; grows three feet high, with purple stalks and leaves; the spikes are short and cylindrical, and frequently produced from the wings of

the stalks; but at the extremity of the stalk arises a large cluster of spikes which are placed crosswise, with one upright stalk in the middle. These are of a bright purple colour at first, but afterwards become darker as the seeds ripen. A native of the Bahama Islands. Introduced 1755.

14. AMARANTHUS RETROFLEXUS (hairy Amaranth). W. a. 33, t. 11, f. 21. *Racemes suprade compound, erect, clustered; branches downy; leaves ovate, wavy.*—It approaches to *A. paniculatus* in the pubescence of the racemes, but differs in having green spikes, setaceous subulate bractes, and leaves waved about the edges. The stem is upright, three feet high. It is a native of Pennsylvania, flowers from June to September, was cultivated by Miller in 1759, and is now become a common weed in many gardens near London.

15. AMARANTHUS OLERACEUS (eatable Amaranth). W. am. 17, t. 5, f. 9. *Clusters axillary, branched; leaves rugose, oblong, very blunt, emarginate.* It resembles the *A. viridis*, but differs from it in the great bluntness of the leaves, deeply emarginate, in the edge of the leaf being neither red nor waved, and in the peduncles and pedicels not being flexuose. It deserves no place in a garden, on account of its beauty. In some parts of India it is used as an esculent herb, being gathered young, and dressed like spinach, but much inferior to it. A native of Guiana, the East Indies, and Egypt; flowers in July. Cultivated by Miller in 1763.

16. AMARANTHUS VIRIDIS (green Amaranth). W. am. 18, t. 8, f. 16. *Clusters axillary, twin, triandrous; male flowers three-leaved; leaves elliptical, emarginate, wavy at edge.*—This sort is distinct from all the rest in having the bractes not surrounding the flowers, but scattered along the rachis. The stem is a foot and half high. A native of Brazil and Jamaica. Flowers in August. Introduced 1768.

17. AMARANTHUS CRUENTUS (various leaved Amaranth). *Racemes decomposed, naked, spreading; leaves lanceolate, ovate; stem two feet high.*—This species varies of a shining red colour, with a red stalk, with pale leaves, with a green stalk, with variegated leaves, &c. When first cultivated in England in 1728, the stem was wholly red and smooth; the petioles,

ribs, and nerves of the leaves underneath purple; the spikes purple, much spreading, and a little nodding. They were very beautiful for the two first years; but afterwards the seeds degenerated, and the plants had little beauty. It is a native of the East Indies and of China; and flowers from June to August.

18. *AMARANTHUS PANICULATUS* (panicled Amaranth). W. am. 32, t. 2, f. 4. *Racemes supradie compound; branches spreading, pubescent; leaves ovate-lanceolate; stem six feet high, grooved.*—It differs from *A. sanguineus* in its pubescent branches, pointed calyxes, and in its whole habit. A native of North America. Introduced 1798.

19. *AMARANTHUS HECTICUS* (oval-leaved Amaranth). W. am. 25, t. 7, f. 13. *Racemes simply spiked; flowers axillary, clustered; leaves ovate, acute.*—Stem red, a foot high, upright, streaked, smooth, a little flexuose at top. Leaves smooth, green, spreading, with a very short point. Petioles channelled, smooth, green. It is doubtful whether this be a distinct sort, or merely hybridous; as perhaps several others are. It is the connecting link, in point of outward form, between the three-stamened and five-stamened Amaranths. It varies much; for from the same seed arise individuals wholly green, red, and rufous liver-coloured; with spikes both green and red, sometimes very thin and slender, sometimes condensed, blunt, and thick, sometimes again long and interrupted: their stature however is always low, and the spike simple. Introduced 1796.

20. *AMARANTHUS POLYGAMOUS* (hermaphrodite Amaranthus). Rumph. t. 82. *Clusters in short spikes; calyx and bractes with hooked bristles; leaves oblong, lanceolate, emarginate; stem a foot and half high, streaked.*—A native of Guiana, China, Cochín, and Amboina. The leaves and stalks boiled are eaten with oil and pepper by the inhabitants, and much liked. Flowers in July and August. Introduced 1780.

21. *AMARANTHUS SPECIOSUS* (showy Amaranth). Bot. Mag. 2227. *Clusters densely spiked, somewhat whorled; spikes decomposed, erect, coloured; leaves oblong, elliptical, red beneath.*—In this plant the stem is erect and much branched; the middle leaves oblong, elliptical, red-purple, brightest on the

under side, tapering at both ends, on long slender foot-stalks; *flowers* bright crimson, on compound terminal racemes, and also on lateral axillary, or less compounded ones; the branchlets are short, and grow two or three together, separated from the rest by a small distance between them, giving the racemes somewhat of a verticillate appearance.

The *Amaranthus speciosus* requires a considerable degree of artificial heat to bring it to perfection. The seeds are sown in March, in a hot-bed in peat and vegetable mould: when they have been up a few days, transplant them into separate small pots, and place them in the frame again. In two or three weeks they must be shifted into larger pots, and when they are become strong plants, remove them into the hot-house, shifting them into larger pots as they advance in size, where they should remain until they come to their full beauty, when they may be removed to the green-house or conservatory.

Upon their first removal to a colder situation, they will sometimes flag so much for a few days, as to make it necessary to take them back to the stove, when they soon recover; and they may then be again removed, and will retain their beauty for two or three months. A native of Nepaul. Introduced 1819.

CULTURE OF AMARANTHS. Those most worthy of a place in the pleasure-garden are the 1st and 2nd, but they are tender, and require attention. They are usually disposed in pots with cockscombs and other showy plants for adorning court-yards, and the environs of the house. Next to these are the 4th and 13th sorts, for the ornaments of the principal borders in the pleasure-garden or parterres. The seeds of these should be sown in a moderate hot-bed, about the end of March, and when the plants come up, they should have much air in mild weather. When they are fit for transplanting, they should be removed to another moderate hot-bed, and placed at six inches distance, watering and shading them till they have taken new root; afterwards they should have free air, and frequent but gentle waterings. In the beginning of June they should be taken up with large balls of earth to their roots, and planted either in pots or the borders

of the pleasure-garden, shaded till they have taken root, and afterwards frequently watered in dry weather. The tree Amaranth must be planted in a rich light soil, and if it be allowed room, and well watered in dry weather, it will grow to a large size, and make a fine appearance.

The 17th is a tender plant, and should be treated like the 1st. The other sorts are sufficiently hardy to bear the open air, and may be sown in a bed of light earth in the Spring; and when the plants are fit to remove, transplanted into any part of the garden, where they will thrive and produce plenty of seeds.

The 4th and 13th must be sown in a good hot-bed in February, or, at the furthest, in the beginning of March, and they will rise in about a fortnight; soon after which another hot-bed must be covered with good rich light earth, about four inches deep, and the plants carefully raised and pricked out into this bed, at the distance of four inches every way, and gently watered. In the middle of the day, let them be secured with mats from the heat of the sun, and raise the glasses to give them air; the glasses should be kept dry, for the moisture exhaled by the fermenting dung and perspiring plants is very injurious. When the plants are firmly rooted give them air every day, more or less, as the weather is cold or hot. In about three weeks or a month, these plants will have grown so as to meet, and must be removed into another hot-bed, with the same rich earth, about six inches thick; observing to take as much earth about their roots as possible, and to plant them at the distance of six or seven inches every way, watering them, so as to settle the earth about their roots. In the heat of the day let them be shaded; refresh them often with gentle watering, and give them air according to the heat of the weather, and cover the glasses every night with mats. In three weeks more the plants will have acquired a considerable size and strength, and should be exposed more and more to the open air when the weather will permit, and then they will become sufficiently hardened to bear being removed into the places where they are to continue the whole season; but they should not be placed in the open air, till after the first week in July, and this should be

done when the air is perfectly soft, and, if possible, in a gentle shower of rain. These plants, when grown to a good stature, perspire very freely, and should therefore be every day refreshed with water, if the weather be hot and dry.

By this management fine Amaranths may be obtained; and these plants, when properly reared, are the greatest ornament to a good garden, for upwards of two months in the latter part of the Summer.

Amaranths are very prolific. Willdenow says that he saved eight ounces of seed from one plant of *A. caudatus*. The seeds retain their germinating quality for several years, but continue longer in the ground than fresh seeds, which germinate in eight days.

AMARYLLIS (name of a Nymph celebrated by poets, and especially by Virgil).

Class 6. 1. Hexandria Monogynia.

Nat. Ord. *Amaryllidæ*.

The Characters are,—*Flower nodding, irregular, funnel-shaped, ringent; filaments declinate, unequal in proportion or direction; seeds flat, numerous.*

1. AMARYLLIS PUMILIO (dwarf Amaryllis). *Flower sessile; leaf one linear; sepals longer than tube, ovate, oblong, reflexed, acute; stamens inclined.*—The tube is an inch in length, white, with six raised white lines on the outside, and as many red ones on the inside. Flowers in November.—Native of the Cape. Introduced 1774.

2. AMARYLLIS PUDICA (modest Amaryllis). Ker's Rev. pl. 8, f. 8. *One flowered; corolla regular, erect, terminate, conniving; one sepal, pushed aside by the stamens.*—A native of the Cape of Good Hope. Flowers from May to July. Introduced 1795.

2. AMARYLLIS REGINA (Mexican Lily Amaryllis). Bot. Mag. t. 453. *Tube fringed, 2-4 ft.; leaves few, lorate, acuminate, with a keeled rib; corolla cernuous, deeply turbinate; tube short, thick.*—Bulb green, scape round, subcompressed. Corolla scarlet, with a bottom of a whitish green; the three outer petals reversed at the tip, the three inner fringed at the base; the style red. The flower-stems seldom rise more than one foot high; each stem supports two, three, or four flowers, rarely more; they are large, and of a bright copper colour, inclining to red; the spathe, which covers the buds before

they open, divides into two parts to the bottom, standing on each side the umbel of flowers, joined to the peduncles. It flowered first in Mr. Fairchild's garden at Hoxton, in 1728, and Dr. Douglas wrote a folio pamphlet upon it, giving it the title of *Lilium Reginae*, because it was in full beauty on the first of March, the queen's birth-day. The roots were brought from Mexico, and therefore Mr. Fairchild called it Mexican Lily, the name which is still continued to it by the English gardeners. It flowers constantly in the spring, when it is placed in a very warm stove. It is in beauty in February, and those which are in a moderate temperature of air will flower in March or April.

Not being so hardy as some others, it must be placed in a warm stove; and if the pots are plunged into a hot-bed of tanners' bark, the roots will thrive better, and the flowers will be strong. It is increased by offsets.

4. *AMARYLLIS EQUESTRIS* (Barbadoes lily, or Amaryllis). Bot. Mag. 305. *Tube fringed, 2-3-fl.; stalks shorter than the erect spathe; tube horizontal; limb curved upwards.*—It flowers towards the end of April. The flowering stem rises above the foliage, to the height of about a foot or more, produces from one to three flowers, similar to, but not quite so large, as those of the Mexican Amaryllis, to which it is nearly related; it differs, however, from that plant essentially in this, that the lower part of the flower projects further than the upper, which gives to its mouth that obliquity which Linnæus describes. The spathe is composed of two leaves, which standing up at a certain period of the plant's flowering like ears, give to the whole flower a fancied resemblance of a horse's head; but its name was derived from the remarkable likeness the front view of it has to a star of some of the orders of knighthood. Aiton regards it as a green-house plant; the bulbs are of the more tender kind. It is propagated by offsets, but not very readily. Introduced 1710.

5. *AMARYLLIS RETICULATA* (netted-veined Amaryllis). Bot. Mag. 657. *Leaves several, lorate-oblong, narrow towards the base; flower cernuous, cucullate, tubular, obliquely ringent.*—A native of the Brazils, distinguished by the petals being transversely veined, and by the smoothness of the throat. The

bulb is round; leaves 4-5, deep green, lorately-oblong, 7-9 inches in length, one to one and a half broad, involutely narrowed downwards, pointed, mid-rib keeled; scape glaucous, slightly compressed, shorter than the leaves, 4-5 inches long; corolla of a lilac-crimson colour; germen faintly coloured, oblong: seeds black-purple, of the size of a pea, few, berried, globular. Flowers in April. Introduced 1777.

6. *AMARYLLIS VITTATA* (superb Amaryllis). Bot. Mag. 129. *Corolla campanulate; outer sepals separate to the bottom; inner united half way by the interior ribs.*—This species is called Vittata, from the gaiety of its flowers, which, from their stripes (red on a white ground), appear like an object decorated with ribbands. It usually flowers in April or May, but may be forwarded by artificial heat. The stem rises to the height of three feet or more; and produces from two to five flowers.

It rarely puts forth offsets from the root, but readily produces seeds, by which it is propagated without difficulty. Introduced 1769.

7. *AMARYLLIS RUTILA* (fiery Amaryllis). Bot. Reg. 23. *About 2-ft. Spathe arid, reflexed; limb turbinate, bilabitate; three upper sepals conniving, recurved; lower, narrow, remote.*—The flower is scentless; the vermilion on the inside sparkling, and streaked with deeper coloured feathered lines; on the outside opaque, suffused with pink, and tinged partially with green and yellow; the funnel or throat within of a greenish white, and six-rayed. A native of the Brazils. Flowers in April and May. Introduced 1815.

8. *AMARYLLIS FULGIDA* (striped-tubed Amaryllis). Bot. Reg. 226. *Leaves oblong, lanceolate, not glaucous; flowers nodding, with an oblique mouth, the upper flower much reflexed.*—The leaves are two inches broad. Scape round, not glaucous; flowers 2-4 without scent; corolla more than five inches long, of a bright glittering salmon-colour, veiny, with a large greenish white faucial star. A native of the Brazils. Flowers in April and May.

9. *AMARYLLIS CROCATI* (saffron-flower Amaryllis). Bot. Reg. 38. *Spathe withered, scarcely as long as stalks; corolla cernuous, unequal; tube as long as germen; upper sepal remote.* The flower has no scent, and is of a

bright glittering salmon-colour, about four inches deep, and almost six across the widest dimension of the aperture, nearly transparent, and streaked with longitudinal parallel veins, not visibly barred in the intervals as in the leaves. Stem two feet high; leaves irregularly latticed-veined. Flowers in April and May. Native of Brazil. Introduced 1815.

10. *AMARYLLIS PSITTACINA* (parrot Amaryllis). Bot. Reg. 199. *Two-flowered, half ringent; membrane of the tube very short, two-coloured, toothletted; stamens included.*—It usually flowers in the spring; and is a very showy plant. It requires the heat of a stove, and increases sparingly by offsets, which should be potted in sandy loam and peat soil. This is a native of Rio Janeiro, and was introduced 1816.

11. *AMARYLLIS CORANICA* (sickle-leaved Amaryllis). Bot. Reg. 139. *Leaves alternate, turned both ways, falcate; scape flat; corolla regular; tube twice as short as revolute limb; stamens erect, spreading.*—Mr. Burchell says: "I discovered this beautiful plant in the Carana country, in the interior of Africa, several days journey beyond the Orange river, in the latitude of 28 degrees south.

"It grew in a grassy plain of sand, in such profusion as to remind me of a vast bed of choice flowers. The air was perfumed by an odour from the blossom resembling that of the Tuberose. It begins to open its flowers in succession, about sunset, and continues in beauty for about a week or fortnight. The bulbs, as they stood when I found them, were nearly nine inches in diameter, of a spherical form, enveloped in a coat formed by innumerable integuments, the outermost of which were grown together in a hard brittle mass, forming the exterior bark. From an estimate of the number of integuments, I should judge the larger bulbs, the growth of not less than 200 years, probably of 300. When divested of the external exuvie, the live part does not exceed four and a half inches in diameter. In their native climate, the bloom is produced in December, and it is not unworthy of remark, how readily they have yielded to the reversal of the seasons in this part of the globe, by flowering in June. Notwithstanding those I have brought home have been three

years and three months out of ground; they are now growing in my garden in as flourishing a state as on their native spot, and have flowered in perfection." Introduced 1816.

12. *AMARYLLIS CALYPTRATA* (green-flowered Amaryllis). Bot. Reg. 164. *Membrane of orifice entire; limb half ringent, nodding, with outer segment incurved at end, the inner recurved.*—This species is remarkable for having the membrane which crowns the orifice of the tube and surrounds the base of the stamens entire, and not, as in most of the other species, split or unravelled into a sort of fringe, or divided into scale-like lobes. The bulb is tumidated, leaves upright, many, firm, two feet and a half in length, an inch and a half in breadth; flowers two, of the largest dimensions in the genus, of considerable endurance, of a yellowish-green colour, without scent. A native of the Brazil. Flowers in May. Introduced 1816.

13. *AMARYLLIS ACUMINATA* (Buenos Ayres, or pointed Amaryllis). Bot. Reg. 534. *Leaves long, strap-shaped, with the scape very caesius; flowers four, ringent, with taper-pointed segments.* The leaves are of a dark green, and longer than those of *fulgida*; the corolla is faintly chequered, and of a pale salmon red; bulb as large as a goose's egg; scape one and a half foot high; germens green, oblong, with three rounded corners; *faux* with a greener star than in *fulgida*. Flowers in April and May. Native of Brazil. Introduced 1819.

14. *AMARYLLIS AULICA* (crowned or Woodford's Amaryllis). Bot. Reg. t. 444. *Tube crowned by a short entire green membrane.*—This splendid species differs from *Calyptrata* and *psittacina*, in having a bright foliage, the outer segments of the corolla much narrower than the inner, and the lowermost one of all involute below the middle; especially from *Calyptrata* by stamens, which are shorter than the limb; from *psittacina*, by a more deeply divided corolla, and a broader crown of one colour. A native of the Brazil. Flowers in December. Introduced 1819.

15. *AMARYLLIS STYLOSA* (long-styled Amaryllis). Bot. Mag. t. 2278. *Leaves sub-erect, glossy, purplish at their base.* It is distinguished from *equestris* (which it resembles in the bulb and in the form and posture of its leaves) by the differ-

ent form and posture of the tube and limbs, the absence of the broad-rayed star, and the style being an inch and a quarter longer, instead of shorter than the corolla, as well as the length of the filaments. The colour of the petals is pale fulvous pink, veined and speckled with a deeper colour. This species, though very inferior to *equestris* in beauty, thrives more freely. A native of the Brazils. Introduced 1820.

Few genera have furnished more hybrid productions than the present. Mr. Sweet, in his *Hortus Britannicus*, enumerates 213. These hybrid productions, so much in vogue at present, are certainly capable of affording pleasing varieties to the florist; but to the botanist they create a great deal of confusion and uncertainty. It must be allowed, however, that valuable physiological discoveries may be made by such enquiries, if carefully conducted. Not only should the species from which the pollen is supplied be carefully recorded, but care should be taken to prevent the possibility of the access of other pollen; and seeds of the mother plant, from which all foreign impregnation has been carefully excluded, should be sown at the same time, that the mere seminal varieties may be compared with the hybrid productions.

Sweet says, "The green-house sorts thrive best in a rich loamy soil; the species should have but little water given them after they have done flowering, so that the bulbs may harden to produce more flowers the following season. Most of them are increased freely by offsets, and ripen plenty of seed. A shell taken from the bulb with a leaf on it, and planted in a pot of mould, will produce a bulb."

The Stove Amaryllises grow best in light loam and rich soil, and the strong growing kinds require large pots to flower in perfection; they are increased by offsets and by seeds, which they bear plentifully, if care be taken to shake some pollen on the stigma at the proper period.

AMASONIA (named from Amazon, a traveller into America).

Class 14. 2. *Didynamia Angiosperma*. Nat. Ord. *Verbenaceæ*.

The Characters are—*Cor. tubulous; limb small, quinquefid; nut ovate, one-celled.*

AMASONIA ERECTA (erect Amasonia). It is a native of Surinam, with an herbaceous stem three feet high, round, and quite simple. The leaves are alternate, petiolate, remote, elliptic-lanceolate, subserrate, and scabrous. The flowers in a simple, terminal raceme, a foot long, with about three flowers on a pedicle. Bractes ovate, sessile, a little longer than the flowers, which are yellow, nodding, and grow all on one side of the stalk.

AMBROSINIA (so named in honour of the two brothers, B. and H. Ambrosinia, for fifty-two years professors of Botany at Bologna).

Class 21. *Monœcia Monandria*. Nat. Ord. *Aroidæ*.

The Characters are—*Spathæ one-leafed, separated by a partition; stamens on the inner; pistils on the outer side of it.*

AMBROSINIA BASSII (flat oval-leaved Ambrosinia). Bocc. fig. t. 26. *Root perennial, tuberous, acrid; leaves radical, petiolate, ovate, shining; spadix quite simple, cylindrical; spathe fleshy, greenish white on the outside, deeper green on the inside, with purple spots, ending in a sharp recurved point.*—The leaves appear at the beginning of Autumn, and decay in the Spring. It is a native of Sicily, near Palermo; and was first found, described and figured by Bocconi. It requires the protection of a green-house, and may be increased from the root. Introduced 1823.

AMBROSIA (a poetical name, a delicious kind of food on which the Heathen Divinities were supposed to feed).

Class 21. 5. *Monœcia Pentandria*. Nat. Ord. *Compositæ*. Sub. Ord. *Ambrosiaceæ* Link.

The Characters are—**MALE** common calyx, one-leafed; cor. one-petalled, trifid, funnel-shaped; recept. naked: **FEMALE** calyx, one-leafed, entire, five-toothed, beneath, one-flowered; cor. 0; nut formed by the indurated calyx, one-seeded.

1. **AMBROSIA INTEGRIFOLIA** (entire-leaved Ambrosia). *Leaves ovate, sessile, acuminate, serrate, ciliated at base, flowers green.*—A native of North America, 3-7 feet in height. Introduced 1810.

2. **AMBROSIA TRIFIDA** (trifid-leaved Ambrosia). *Moris. s. 6, t. 1, f. 4. Leaves three-lobed, serrated.*—This spe-

cies is a common annual weed in North America, growing often eight or ten feet high, and in a rich moist soil, spreading out into many branches; the flowers are not more conspicuous than those of hemp: cultivated in 1699. The sort common in gardens has three-lobed leaves; but the variety B has the lower leaves five-lobed.

The seeds of this species, sown in Spring, will remain till the following Spring, and when the plants come up, they may be transplanted into a moist rich soil, at the distance of four or five feet. If the seeds ripen, and are suffered to scatter, they will vegetate the following Spring, provided that the ground be not disturbed; or if the seeds be sown in Autumn, the plants will come up in the Spring, and may be treated as above.

3. *AMBROSIA ELATIOR* (tall Ambrosia). Herm. lugd. t. 35. *Leaves bipinnatifid, smoothish; petioles with long ciliæ; racemes terminal, paniced.*—This is an annual herbaceous plant, from two to three feet in height, upright, and branched; male flowers more numerous, approximating and nodding; the female flowers fewer, sessile, from three to six, aggregate. A native of Jamaica, in barren, sandy, rocky situations by river sides, in the southern part of the island; flowers there from February to June, with us in July and August. It has the appearance and taste of wormwood; and the seeds have been imported from Virginia and Carolina, as well as from the West Indian islands. Introduced 1696.

It will thrive in the open air in England; but in order to obtain the seeds every year, they should be sown on a moderate hot-bed in March; and when the plants are two inches high, they must be transplanted into another moderate hot-bed, allowing to each plant a square distance of three or four inches, watering and shading them, till they have taken root, and afterwards exposing them to the air in warm weather, and well watering them. When the plants are pretty strong, they should be taken up with balls of earth to their roots, and planted in large pots filled with light earth; and towards the latter end of May they should be placed abroad.

4. *AMBROSIA ARTEMISIFOLIA* (mug-

wort-leaved Ambrosia). *Leaves bipinnatifid, hoary beneath, upper pinnatifid; racemes terminal.*—It differs from the *elatior* in having the spikes of the flowers axillary; the racemes are lateral, and not terminal; the primary stem about a foot high, is more diffused, and the branches four feet long. A native of North America. Introduced 1759. Cultivated in the same manner as the *elatior*.

AMBROSIA PANICULATA (paniced Ambrosia). Plu. alm. t. 10. f. 5. *Leaves smooth, bipinnatifid, upper pinnatifid; racemes terminal, solitary; branches fastigiate.*—A native of North America, stem 3-6 feet in height. Introduced 1811.

6. *AMBROSIA MARTIMA* (Sea Ambrosia). Sch. hand. 3, t. 292. *Leaves bipinnatifid, blunt, hoary beneath; racemes terminal, solitary; branches villos.*—In this species the spike does not sit on a long peduncle, as in the *artemisiifolia*. Grows naturally in Capadocia, Tuscany, &c. on sandy shores. Introduced 1570.

The seeds should be sown in a warm border in Autumn; and when the plants come up in the Spring, they should be transplanted into a warm border of poor ground; the best method for obtaining good seeds, is to plant some of them in lime rubbish; the plant has not much beauty, and is admitted into gardens merely for variety.

AMELLUS.

Class 19. 2. Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle paleaceous; pappus simple; involucre imbricated; florets of ray undivided.*

AMELLUS LYCHNITIS (trailing Amellus). Jac. co. su. t. 10, f. 1. *Leaves hoary, linear, lanceolate, opposite; those of the branches alternate.*—This species, a perennial plant, rises from two to three feet high, sending out branches on every side, terminated by flower-stalks, each supporting one violet-coloured flower, with a yellow disk, shaped like those of the aster, and appearing in July or August. The down is villose with few rays: a native of the Cape of Good Hope. Cultivated in Kew Gardens by Mr. Miller, in 1768. It is easily propagated by cuttings, planted in the shade in the Summer months, and well watered. The plant should be taken up with beds of earth,

and put in pots, so as to be sheltered in Winter, under a common frame or in a green-house, with plenty of air in mild weather.

AMERIMNUM (from a priv, and *merimna*, care; void of care).

Class 17. 4. Monadelphia Decandria. Nat. Ord. *Leguminosa*.

The Characters are—*Calyx sub-bilabiate; legume compressed, leafy, two-valved, dehiscent; some seeds solitary*.

AMERIMNUM BROWNEI (Browne's Amerimnum). Ja. am. t. 180, f. 58. Unarmed; leaves simple, stalked, alternate, subcordate, ovate; racemes compound, axillary, and lateral.—This rises commonly to the height of ten feet, and supports itself on other shrubs. It is a native of Carthage, Jamaica, and Domingo. It requires a light loamy soil. Cuttings not deprived of their leaves, strike root freely, plunged under a hand-glass in a warm situation.

AMETHYSTEA (from the Amethyst, alluding to the colour of the flower).

Class 2. 1. Diandria Monogynia. Nat. Ord. *Labiata*.

The Characters are—*Corolla four-cleft, nearly equal, with the lowest segment concave; stamens near each other; seeds naked*.

AMETHYSTEA CERULEA (blue-flowering Amethystea). Bot. Mag. 2248. Leaves opposite, stalked, three-parted, coarsely serrated, smooth.—It is annual, and hath an upright stalk, which rises about a foot high, and towards the top puts out two or three small lateral branches; the leaves are small, trifid, sawed on their edges, and of a very dark green colour; at the extremity of the branches the flowers are produced in small umbels; these are of a fine blue colour, as are also the upper part of the branches and the leaves, immediately under the umbel; so that, though the flowers are small, yet from their colour with that of the upper part of the stalks, the plants make a pretty appearance during their continuance in flower. The flowers have an agreeable smell. It requires to be sown in pots in frames, or on a gentle hot-bed; and as soon as the plants are large enough, they may be planted out in borders in the open ground.

AMHERSTIA (named by Dr. Willich, after the Right Hon. Countess Amherst, and her daughter, Lady Sarah Amherst, the zealous friends and con-

stant promoters of all branches of natural history, especially Botany, who, during their residence in India, performed an arduous and extensive journey to the northern regions of Northern and Western Hindoostan, spending many weeks among the mountains near the Himalaya, where they obtained a very interesting collection of preserved specimens of plants).

Class Diadelphia Decandria. Nat. Ord. *Leguminosa*.

The Characters are—*Floral bractes, large, valvate; corolla five-petalled, irregular; stamens ten-diadelphous; anthers polliniferous*.

AMHERSTIA NOBILIS (noble Amherstia). Wall. pl. a. r. t. l. Leaves ample, pinnate; leaflets large, oblong.—This tree, when in foliage and blossom, is the most superb object that can possibly be imagined, and not surpassed in magnificence and elegance by any plant in the world. The flowers are large, of a fine vermilion colour, diversified with yellow spots. The Burmese name of the tree is *Thoka*. It is from thirty to forty feet in height. The natives present handfuls of these flowers as offerings in the cave, before the images of Buddha. Along with this tree were found some trees of *Messua ferrea*, and *Jonesia Asoca*. It is not a little remarkable, that the priests of these parts should have manifested so good a taste as to select three sorts of trees as ornaments to their objects of worship, which can hardly be surpassed in beauty. Native of the Burman Empire, found by Mr. Crawford in the garden of a decayed Kioun, a sort of monastery, two miles from the right bank of the Salnen river, and twenty-seven miles from the town of Martaban; but its native place of growth is still unknown, as the trees found in the garden have undoubtedly been planted there. It will grow freely in a light loamy soil, and large cuttings root readily if planted in sand, with a hand-glass placed over them in heat.

AMIROLA.

Class 21. 7. Monœcia Polyandria. Nat. Ord. *Terebintaceæ*.

The Characters are—*MALE calyx, five-fid; lower segment cut down to the base; cor. 0; stamens 8, declinate; FEMALE as in the male; style incurved; capsule three-coccos, inflated, three-valved; seeds globose*.

AMIROLA NITIDA (shining-leaved Amirola). *Leaves simple and ternate, ovate, serrated; petioles thickened on each side.*—A tree twenty-four feet high: native of Peru. The Peruvians form the shining black seeds into rosaries. May be increased by cuttings; planted in peat and loam. Introduced 1824.

AMMANNIA (named in honour of John Ammann, a native of Siberia, who was a physician and professor of Botany at St. Petersburg. He published a work upon the plants of Finland, &c. None of the species have any beauty).

Class 4. 1. Tetrandria Monogynia. Nat. Ord. *Salicariæ*.

The Characters are—*Calyx one-leaved, campanulate, plaited, eight-toothed; petals 4, inserted in the calyx, or very often none; capsules 2-4 celled, many-seeded.*

1. **AMMANNIA LATIFOLIA** (broad-leaved Ammannia). Slo. Jam. 1. t. 7. 5. 4. *Leaves stem-clasping; stem square; branches erect.*—This species grows about a foot and a half high, with leaves long, narrow, and triangular, as long as the stem, of a pale green colour, and the flowers proceed in clusters from the joints, where the leaves adhere. A native of moist places in Jamaica. Flowers in July and August. Introduced 1733.

2. **AMMANNIA DEBILIS** (cluster-flowered Ammannia). *Leaves lanceolate, attenuated at base; stem branched; flowers fascicled, axillary; capsule bicellular.*—This species is annual, the calyx angular; petals pale purple; filaments shorter than the calyx; anthers ovate and yellow. A native of the East Indies. Introduced 1778.

3. **AMMANNIA CASPICA** (Caspian Ammannia). *Leaves sessile, lanceolate, attenuated at base; flowers purple, axillary clustered; sepals rigid, acute.* A native of Astrachan; flowering in July. Introduced 1821.

4. **AMMANNIA BACCIFERA** (berry-bearing Ammannia). *Leaves somewhat stalked; capsule longer than calyx, coloured.*—This is a tender low plant, erect, without branches. Stem reddish, round; leaves opposite lanceolate, quite entire. *Flowers* in whorls, many at the axil of the leaves, sitting each on its proper peduncles. It is a native of China, and is now naturalized in Italy. The leaves have a strong muriatic smell,

they are extremely acrid, and are used by the native practitioners of India to raise blisters in rheumatism, &c. and bruised and applied to the part of the body intended to be blistered: they perform their office in half an hour most effectually. Introduced 1820.

5. **AMMANNIA RAMOSIOR** (branching Ammannia). Bocc. Mus. t. 104. *Leaves half-stem clasping; stem square; branches much spreading.*—This is an annual plant, and grows naturally in bogs in Virginia and Carolina; rises about a foot high, with red succulent stalks, putting out side branches opposite, and simple; the flowers are produced single from the axils on the lower part of the branches, and towards the top in clusters of a purple colour. Introduced 1759.

6. **AMMANNIA SANGUINALENTA** (bloody Ammannia). *Leaves half-stem clasping, linear, lanceolate cordate at base; peduncle very short, many-flowered.* A native of Jamaica, in bogs and ditches. Introduced 1083.

7. **AMMANNIA OCTANDRA** (octandrous Ammannia). Box. 6. cor. 2. t. 133. *Leaves linear, lanceolate; sessile, acutely and auriculately cordate at the base; flowers red, axillary, 1-3 together; petals four; stamens eight; capsules four-celled.*—A plant two feet high. Native of the East Indies, in boggy places.

8. **AMMANNIA EGYPTIACA** (Egyptian Ammannia). *Leaves lanceolate, attenuated at the base; sessile spreading; sessile at the base, something like whorls; capsule spherical.*—Native of Egypt, in rice fields. Flowers in July. Introduced 1820.

9. **AMMANNIA ROTUNDIFOLIA** (round-leaved Ammannia). D. Don., fl. N. p. 220. *Leaves almost sessile, nearly orbicular; flowers sessile, crowded in the axils of the upper leaves, and constituting terminal spikes; petals four, ovate, pink.*—A native of Nipaul. Flowers in July. Introduced 1819.

They must be raised from seeds on a hot-bed in the spring, and afterwards removed to another hot-bed to bring them forward. When the plants have acquired strength, they should be transplanted into pots filled with rich light earth, and placed under a frame three or four plants in each, observing to shade them till they have taken fresh root; then they should be placed in the

stove, or warm part of a green-house, placing each in a pan of water to ripen their seeds; for the plants are too tender to thrive in the open air in this country, unless the summer should prove very warm.

Ammi (from *ammos*, sand).

Class 5. 2. Pentandria digynia.

Nat. Ord. *Umbelliferae*.

The Characters are,—*Involucre pinnate or pinnatifid; fruit oblong, with five obtuse ribs, and convex intervals.*

1. **AMMI VISNAGA** (carrot-like Ammi, or bishop's weed). Goë. de. fr. l. t. 107. *Universal umbel united at base*.—A native of the South of Europe, of long standing in our gardens, having been cultivated in 1596. It has a delicate habit, and very finely-cut leaves. The flowers are produced from June to August.

2. **AMMI MAJUS** (great Ammi). Blakw. t. 447. *Lower leaves pinnate, lanceolate serrate; upper multifid linear*.—This species is annual, and grows in vineyards and fields in the Southern parts of Europe, and in the East. It is three feet in height. The leaves are a grass green, and the flowers white. The seeds are accounted drying and warming, good to expel wind from the stomach, &c. Cultivated by Gerard, in 1527. Is propagated by seeds sown in Autumn, in the place where they are to remain; in the Spring, the ground should be hoed, and the plants thinned as in the management of carrots, leaving them four or five inches asunder, or in good ground at the distance of six inches, after which they will require no further care, besides being kept free from weeds. They will flower in June, and the seeds will ripen in August, and should be gathered as they ripen, for they will soon scatter.

3. **AMMI GLAUCIFOLIUM** (glaucous-leaved Ammi). *Segments of all the leaves lanceolate*.—A perennial plant, which is preserved in botanic gardens for variety: but having little beauty, is rarely admitted into other gardens. The stem is two feet high, hard and smooth, with several upright branches at top. It is a native of the South of France. Introduced 1816.

4. **AMMI DAUCIFOLIUM** (carrot-leaved Ammi). Scop. carn. t. 10. *Leaves supra-deccompound; leaflets three-parted, pinnatifid*. The stem two feet high, flowers pale yellow, perennial. A na-

tive of the Pyrenees. Propagated the same as the *A. majus*. Introduced 1734.

AMMOBIUM.

Class 19. 1. Syngenesia *Æqualis*.

Nat. Ord. *Compositæ*.

The Characters are,—*Involucrum, imbricated, colored, radiant; anthers with two bristles at the base; chaffs of receptacle distinct; pappus a toothed edge.*

1. **AMMOBIUM ALATUM** (winged Ammobium). Bot. Mag. 459. *Leaves oblong, ovary, decurrent*.—A pretty half-hardy, New Holland, herbaceous plant, with dry white involucre scales, like a *Gnaphalium*. It was discovered by R. Brown, Esq. in 1804, growing plentifully near the shores of Port Hunter, N.S.W., and named by him *Ammobium*, from its growing in sand. Mr. Sweet recommends "its being planted in a south border; and should the winter be severe, to be occasionally covered with a little straw or fern; but always leaving it uncovered in mild weather, that it might not rot." Introduced 1822.

AMOMUM (a corruption of *phamama*, the Arabic appellation of this plant).

Class 1. 1. Monandria Monogynia).

Nat. Ord. *Scitamineæ*.

The Characters are,—*Inner limb of the corolla with one lip; anther with an entire or two-lobed crest; seed with an arillus.*

1. **AMOMUM AFZELII** (sweet-scented Amomum). Ann. Bot. l. t. 13. *Scape very short; flowers heaped; leaves distant, ovate; acum, entire smooth; capsule oblong, triangular*.—This species differ from the *A. grandiflorum* in having a very short stalk, two external bracteas only, and a deeply cloven central lobe of the filament. The leaves, also, are broader; whereas in *grandiflorum* the bracteas are numerous, and the central lobe of the filament undivided. It was first discovered by Prof. Afzelius at Sierra Leone; the flower of a pale flesh colour, are only fragrant when dried. The seeds are of a dark brown, highly polished, with scarcely any flavour, and not at all aromatic. The plant is about three feet in height. Introduced 1795.

2. **AMOMUM GRANDIFLORUM** (large-flowered Amomum). Ex. Bot. t. 111. *Scape short; flowers numerous; close, sterile; stem simple; leaves elliptic; lanceolate pointed; capsule oblong,*

bluntly triangular; minutely hispid.—The root is perennial, creeping, woody. Stems about three feet high. Leaves deep green, often tinged with red, very smooth. The flowers are clustered, large, and handsome; highly aromatic when dried and moistened again. The seeds have a stimulant flavour, resembling that of Camphor, equal to any cardamon whatever. The flowers are produced in June and July. A native of Sierra Leone. Introduced 1795.

3. *AMOMUM ANGUSTIFOLIUM* (narrow-leaved Amomum). Sonn. it. 2. t. 137. *Scape naked, very short, spike, capitate; leaves linear, lanceolate; capsule ovate, pointed, striated.*—Dr. Roxburgh says: "the flowers possess a considerable share of spicy fragrance, and are showy: the upper bractees, and exterior border of the corolla, being red, and the large lip yellow. The flower stalks rise above the ground, and are seven or eight inches high, clothed with tubular scales; flowers in a short crowded spike, with a concave bractea to each, near an inch and a half long. The stem is eight or ten feet high, and the pedal leaves very narrow. Native of marshy ground in Madagascar. Flowers in June and July.

4. *AMOMUM GRANA PARADISI* (grains of Paradise Amomum). Rh. mal. 11. t. 6. *Scape branching, lax, ovate; capsule oblong, bluntly triangular, hispid.*—It is a native of Guinea, and of the islands of Ceylon and Madagascar, from whence we receive the seeds, which are of a warm aromatic nature, much resembling pepper, for which they are frequently substituted in many places. They are but little used in medicine, but might prove useful in cold flatulent disorders, the colic, &c.

The root is perennial, creeping horizontally; stems erect, leafy, three feet high, destitute of flowers; spikes capitate; bractees ovate, rather shorter than the fruit, lower ones crowded; capsule oblong, bluntly triangular, minutely hispid; seeds brown, ovate. Introduced into Kew Gardens in 1786.

5. *AMOMUM DEALBATUM* (insipid Amomum). *Leaves broad, villous beneath; spikes radical, lip round, oval; crest broad, truncated; capsule nine-winged.*—An ornamental species, with white flowers; three feet high; flowers in March and April; perennial. A native of Bengal. Introduced 1819.

6. *AMOMUM SYLVESTRIS* (wild Amomum). Slo. jam l. t. 105. *Scape naked; spike elong; bract. inflated; leaves broad, lanceolate.*—This species resembles the *Zingiber zerumbet*, except that the stalk rises eight or nine feet high, that it has much larger leaves, and that, instead of the flowers and fruit being on the end of the same stalk, they are on another about three feet high, immediately springing from the root. It is a native of the woods of Jamaica: the root is warm and stimulates gently, and may be properly administered as a stomachic and alexpharmic. Flowers in March and April. Introduced 1819.

7. *AMOMUM SUBULATUM* (subulate Amomum). *Leaves lanceolate, smooth; spikes obovate, echinated; lip oblong.* Stem three feet high. Flowers yellow. A native of Brazil. Introduced 1822.

8. *AMOMUM MAXIMUM* (great Amomum). Bot. Reg. t. 929. *Spikes ocal, on short stalks; bractees lanceolate; crest of one semi-lunar lobe; capsules globose, with nine-ribs.* Native of the Malay Archipelago. Long cultivated in the Calcutta garden, where it blossoms in April and May, ripening seed in September and October. The flowers are nearly white, with a small tinge of yellow on the middle of the lip. The seeds have a warm pungent aromatic taste, not unlike the real cardamon, but by no means so grateful. This species flowered in June, 1824, at Sion House, where it had been cultivated for several years.

9 *AMOMUM CARDAMOMUM* (cluster cardamon or True Amomum). Ger. Em. 548. *Leaves lanceolate; spikes lax, many flowered; bractees lanceolate, acute; lip three-lobed; crest of three nearly equal; erect lobes; capsules globular.* Native of the Malay Islands, where the inhabitants use the seeds as a substitute for the Malaba or lesser cardamon. It is certainly the true original amamon, of the shops still to be met with at Venice and other parts of the South of Europe, though generally supplanted by the more valuable Lesser Cardamon, which Linnæus founded herewith; and of which we propose to treat by the name of *ELSTARIA* hereafter.

This species has thick fleshy roots, resembling those of the large flagiris, which in the spring send forth many

green reed like stalks that rise to the height of seven or eight feet, garnished with very long narrow leaves, alternate, and narrow. The *spike* is an inch long, sometimes two when in seed, with many pale, smooth, imbricated, elliptic-lanceolate *bracteas*, near an inch in length, one to each *flower*. The germen, calyx, and common receptacle are hairy, or rather bristly; *capsule* sessile, the size of a black currant, globular, somewhat depressed, obscurely three-lobed, striated, crowned with a blunt protuberant scar; *seeds* roundish, angular, dotted, brown, aromatic, and pungent, resembling in flavour the *Eletaria*, but less powerful, and rather less agreeable.

In Malabar, cardamon is an object of considerable commerce. The Indians also themselves make great use of it, mixing the seeds with their bread, under a notion that it facilitates digestion.

10. *AMOMUM ACULEATUM* (prickly oval Amomum). *Spikes* obovate, on short stalks; *bracteas* lanceolate; crest of the filament abruptly three-lobed; *capsule* oval, prickly; *leaves* nearly sessile, lanceolate; heart-shaped at the base.—A native of the Malay Archipelago, from whence it was brought to the Calcutta garden, and flowered freely there in April and May, ripening seed in October. The capsule is frequently destitute of grooves, and its coat of a soft fleshy texture. The species of this genus are tender stove plants which should be planted in rich sandy soil, and grown in large pots in a moist heat. Introduced here in 1823.

AMORPHA (from *a* priv and *morphe* form, in allusion to the deformity of the corolla, which has neither alæ or carina.

Class 17. 4. Monadelphia Decandria. Nat. Ord. Leguminosæ.

The Characters are—*Calyx* campanulate, five-fid.; *vexillum* ovate, concave; alæ, 0; *carina*, 0; *legume* two-seeded, falcate.

1. *AMORPHA FRUTICOSA* (shrubby bastard Indigo). Bot. Reg. 427. *Teeth* of *calyx*, four blunt, one acuminate.—This shrub grows naturally in Carolina, where formerly the inhabitants made a coarse sort of indigo from the young shoots, which occasioned their giving it the title of *bastard indigo*. It rises with many irregular stems to the height of twelve or fourteen feet, with very long winged leaves, in shape

like those of the common ACACIA. At the extremity of the same year's shoots, the flowers are produced in long slender spikes, which are very small, and of a deep purple colour; appearing in the beginning of July. After the flowers are past, the germen turns to a sharp pod, having two kidney-shaped seeds; but these do not ripen in England. They were sent to England by Mark Catesby in 1724.

This shrub, which Thunberg observed in the great island of Nipon belonging to Japan, is become very common in all the gardens and nurseries near London, where it is propagated as a flowering shrub, for the ornament of the shrubbery. It is generally propagated by seeds, sent annually to England from different parts of America, which arrive in February, and are sown in a light soil; they may be also cultivated by laying down the young branches, which in one year will make good roots, and may then be taken off and planted, either in the nursery, or the places where they are designed to remain.

2. *AMORPHA NANA* (dwarf bastard Indigo). Bot. Mag. t. 2112. *Smoothish*, *leaves* on short stalks, blunt at each end; *spikes* solitary, short; *pods* one-seeded.—An upright low shrub. A native of the woodless and grassy hills of the Missouri, from the river Plate to the mountains, where it scarcely exceeds a foot in height. Flowers fragrant, deep purple, with inserted golden-coloured anthers. Mr. Nuttall remarks that this very humble plant is often diffused, like heath in Europe, over hundreds of acres in succession, and seems to be the only upland shrub capable of withstanding the peculiarities of that climate.

The *calyx* is two-lipped, and the two teeth of the upper lip are much shorter than the three lower, but all are pointed; the upper less so than the others. Flowers in May and June. It is rather tender, the young shoots generally dying black, even in the green-house. Introduced 1811.

3. *AMORPHA PUBESCENS* (pubescent bastard Indigo). Bot. Cab. t. 689. *Leaves* on short stalks without a point, obtuse, smooth; *spikes* long, panicled, downy.—A native of Carolina and Georgia, in dry sandy fields, growing to two or three feet high. It flowers

freely in the month of September. The stems decay nearly to the root in Winter, and the whole plant is rather tender, needing a little shelter in that season. The soil should be sandy peat, and it may be increased by cuttings of the roots. Introduced 1803.

AMORPHA CANESCENS (canescent bastard Indigo). *Hoary, leaflets subsessile, ovate-elliptical, acute, mucronate; spikes panicled, hoary.*—An ornamental shrub, three feet in height. The flowers are of a blue colour, and produced in July and August. A native of North America. Introduced 1812.

5. **AMORPHA CROCEOLANATA** (yellow-haired bastard Indigo). *Dend. brit. 139. Ferruginous, spikes simple, clustered; leaflets ovate-lanceolate, downy, mucronate.*—A shrub three to five feet in height. Flowers of a bluish-purple. Flowers in July and August. A native of North America. Introduced 1803.

Amorpha is a genus of elegant flowering shrubs, and are well adapted for small shrubberies, or the front of large ones. They thrive well in common garden soil. They may be increased by layers, or cuttings, taking off at a joint, and planted in a sheltered situation, early in Autumn will take root.

AMPELOPSIS (from *Ampelos* a vine, and *opsis*, resemblance).

Class 5. 1. Pentandria Monogynia.

Nat. Ord. *Ampelideæ*, D. C.

The characters are,—*Calyx entire; petals cohering at the end, withering; stigma capitate; ovary immersed in the disk; 2-4 seeded.*

1. **AMPELOPSIS CORDATA** (heart-leaved Ampelopsis). *Leaves cordate, acuminate, nearly equally toothed, smooth on both sides; racemes loosely many-fruited.* A climbing shrub; the flowers of a reddish colour, are produced in June and July; berries pale red. Native of North America, on river sides and among hedges. Introduced 1803.

2. **AMPELOPSIS BIPINNATA** (peppervine Ampelopsis). *Ach. Bon. 3. t. 24. Leaves cordate, acute-toothed, three-lobed; nerves villous beneath; racemes twin-bifid.*—A shrub ten feet high, with small green flowers, which are produced from June to August; the berries cream-coloured, globose. A native of Virginia and Carolina, in shady woods or river sides. Introduced 1700.

3. **AMPELOPSIS QUINQUEFOLIA** (Virginian-creeper, or ivy-leaved Ampelop-

sis). *Corn. car. t. 100. Leaves palmate, 3-5 leaved, smooth on both sides; leaflets stalked, oblong acuminate.*—A climbing shrub; flowers green and purple. The leaves turn red in autumn. Fruit small and black. Blooms in June and July. Native of North America on Alleghany mountains. Introduced 1629.

4. **AMPELOPSIS HIRSUTA** (hairy Ampelopsis). *Leaves palmate, 3-5 leaved on each side, pubescent; leaflets ovate, acuminate, coarsely-toothed.*—A climbing shrub, flowering in April and May. Native of the Alleghany mountains. Introduced 1806.

5. **AMPELOPSIS CAPREOLATA** (climbing Ampelopsis). *Leaflets five, elliptical, acuminate, bristly toothed; umbels axillary, 4-rayed, shorter than the leaves; flowers axillary.*—The hardy species of this genus resembles the vine in habit, leaves and flowers, and is commonly employed in covering old walls, &c. for which the rapidity of their growth renders them very suitable. They are easily increased by layers or cuttings in the autumn. The stove species are not worth growing. Cuttings of these will strike root readily in sand, under a hand-glass, in a moist heat. A climbing shrub. Native of Nipaul.

AMPHEREPHIS.

Class 19. 1. Syngenesia Polygamia Æqualis.

Nat. Ord. *Compositæ*.

The Characters are *Involucers hemispherical, imbricated; receptacle flat-naked; florets all tubular; pericarp cylindrical, naked; pappus hairy, deciduous.*

AMPHEREPHIS INTERMEDIA (intermediate Amphecephis.) *Swt. 6. l. g. t. 225. Leaves of involucers foliaceous; inner, ovate, oblong, rounded; outer, awned.* "This pretty plant," Sweet observes, "is a native of Brazil, and requires the treatment of the half hardy annuals, the seeds to be sown early in the spring, either on a hot bed made on purpose for rather tender annuals, or it may be raised in pots in the hot-house or green-house, or in frame, and must then be planted out in a sheltered situation in the flower garden, about the middle of May, that it may attain strength to flower fine in August. It will probably survive several years, if kept in the stove through the winter, and may then be increased by cuttings."

It thrives well in any rich light soil, and produces an abundance of seeds." Introduced 1821.

AMPHITHEATRE, or temples of view, erected on a double rising, were esteemed great ornaments to a large and noble garden. If this hill, or rising ground, is of a semicircular figure, it will be still the better.

These amphitheatres are sometimes formed of evergreens, as *hollies*, *phillyreas*, *laurustinuses*, *bays*, &c. observing to plant the shortest growing shrubs in the front, and the tallest trees behind, as *pin*es, *firs*, *cedars of Lebanon*, &c.

They are also formed of slopes on the sides of hills, and covered with turf, but are now generally excluded by all persons of true taste; for the natural easy slope of such hills, is infinitely more beautiful than the stiff angular slopes into which these amphitheatres are commonly cut.

AMPHODUS (formed from two Greek words, signifying "a tooth on each side," in allusion to the peculiar processes of the base of the vexillum.

Class 17. 4. *Diadelphia* Decandria.

Nat. Ord. *Leguminosæ*.

The Characters are,—*Calyx* bracteous, thrust in at the base, bilabiate; upper lip bidentate, lower one trifid, with subulate segments; corolla with a reflexed vexillum, which is furnished with an inflexed tooth on each side at the base; wings and keel linear; stamens diadelphous; style filiform, glabrous, rounded by a capitate stigma; legume, linear-oblong, compressed, many seeded, wingless; seeds oblong, compressed, greenish brown, with a small linear hylum, and girded by a thick white arillus.

1. **AMPHODUS OVATUS** (ovate-leaved amphodus). Bot. Reg. t. 1101. *Leaves innately-trifoliate; leaflets stipulate, ovate*.—A tender stove plant, like all similar climbers, requiring a rafter or a wire to twine round. It is hairy in every part, except the upper surface of the leaves. The short axillary racemes of large purple flowers are produced in July and August. Native of Trinidad. It is easily increased by cuttings, planted in a rich soil, under a hand-glass and heat.

AMSONIA.

Class 5. 1. *Pentandria* Monogynia.

Nat. Ord. *Apocynæ*.

The Characters are—*Corolla*, funnel-

shaped, closed at the orifice, with a five-lobed limb; stigma capitate, surrounded by a membranous angle; seeds obliquely truncate, naked.

1. **AMSONIA LATIFOLIA** (broad-leaved Amsonia). Bot. Reg. 151. *Stem smoothish; leaves oval; lanceolate, the upper acuminate, beneath a little hairy*.—This is a perennial plant, sending up in the spring two or three herbaceous stalks near a foot high. Its blue flowers are produced in small terminal bunches, and having a fragrance resembling that of the violet; said by Pursh to grow in wet shady woods in Carolina. With us, a tolerably hardy perennial plant, of easy culture, and long known in our gardens. Introduced 1759.

2. **AMSONIA SALICIFOLIA** (willow-leaved Amsonia). Bot. Mag. 1873. *Stem smooth; leaves linear, lanceolate, acute at each end, quite smooth*.—This species is considered as a hardy perennial; but being a native of South Carolina and Georgia, should have a warm situation, and some protection from very severe frost. Flowers in June and July. Introduced 1812.

3. **AMSONIA ANGUSTIFOLIA** (hairy-stalked Amsonia). Vent. choix, 29. *Leaves narrow, lanceolate, close, erect, pubescent; stem obviously pubescent*.—Native of North America. Intro. 1774.

All the *Amsonias* are pretty plants, which grow in any light soil, but, in dry weather, require frequent waterings; they seldom produce seeds with us, and are, therefore, propagated by offsets, which are but sparingly produced. Cuttings root freely under a hand-glass.

AMYGDALUS (the Greek name of the Almond).

Class 12. 1. *Icosandria* Monogynia.

Nat. Ord. *Amygdalinæ*—D. Don.

The Characters are,—*Calyx* five-cleft; petal five; drupe with a nut perforated on its surface.

1. **AMYGDALUS NANA** (common dwarf Almond). Bot. Mag. t. 161. *Leaves ovate, attenuate at base, simply and finely serrate*.—The Dwarf Almond, a native of Russia and Tartary, is justly considered as one of our most ornamental shrubs; it rarely rises above the height of three feet, and hence becomes very suitable for the shrubbery of small extent. It flowers about the middle of April, somewhat later than the common Almond. Introduced 1683. The roots are apt to put out suckers, by which the

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plant may be increased in plenty; and if those are not annually taken away, they will starve the old plant.

2. *AMYGDALUS INCANA* (woolly Almond). *Leaves oblong, lanceolate, serrate, downy, beneath; drupe compressed, pubescent.*—A spinose shrub, two feet in height, with solitary red flowers, which are produced in March and April. A native of the Levant, between Smyrna and Bursa and of the Caucasus.

3. *AMYGDALUS ORIENTALIS* (Oriental or silver-leaved Alond). *Lam. diet 1. p. 103. Leaves lanceolate, quite entire, almost permanent, clothed with silvery tomentum, as well as the branches; fruit mucronate.* A shrub two to four feet high; flowers rose-coloured, produced in March and April. A native of the Levant. Introduced 1756.

4. *AMYGDALUS GEORGICA* (Georgian Almond). *Du. Arb. 2. 221. Calycine lobes lanceolate, length of the tube; style inclosed.*—This pretty little vernal shrub, which readily forms a very close tuft, because it produces annually new shoots from the root, and its stalks ramify considerably, blooms for about a dozen days before the dwarf almond, from which it is distinguished by its stronger, straight, stiff stems, five to six inches high, covered with a thin chappy, ashy, and friable coating—by its polygamous diocious flowers. (Each flower has a very reddish flower-cup, whose tube is cylindrical, or slightly bellied, with five grooves, and terminated by an open limb, with five oblong, greenish, and finely notched divisions; five narrow petals, cornered, veined, entire, or frequently jagged at the summit: a score of fibres, at first white, then rose-coloured, inserted upon two rows at the orifice of the flower-cup, shorter than the petals, and terminated by small, oval, bilobed, primrose-coloured anthers)—by the colour of its shoots, which are reddish, but towards the end of autumn lose that colour, and assume that of the old branches—by the form of its leaves, (which are oblong-lance-shaped, interlaced at the base and top, shining on the upper side, two to three inches long,) and particularly their lateral ribs, which are less numerous and less projecting underneath, and by their teeth, which are not so sharp. The fruit is of the form and thickness of that of the Dwarf Almond, but it is redder and more hairy; the pulp is thinner;

its shell, without pores on its surface, is rather harder; it contains a bitter almond. In the spring, it is covered with an immense quantity of beautiful red flowers, an inch broad, which last, or succeed, for more than fifteen days, and render it the most interesting and prettiest little shrub of the season; deserving to be less rare, and to occupy a distinguished place in pleasure gardens. It is easily multiplied by the shoots, sprigs, and seeds; but it requires good rich soil. It rarely exceeds six or seven feet in height. Is a native of Georgia. Introduced 1820.

5. *AMYGDALUS PUMILA* (double dwarf Almond). *Bot. Mag. 2173. Branches smooth, two to three feet high, dark purple; leaves lanceolate, petiolate, veined, wrinkled, serrulate; flowers generally two to a bud, sessile; calyx reddish; petals emarginate, red, longer than the tube of the calyx; filaments paler; germ and style pubescent at base; stipules linear, very deeply serrate.*—It varies with double flowers. Its native place is Africa. These shrubs make a very agreeable variety amongst low flowering trees, in small wilderness quarters. The single sort flowers the beginning of April, and the double in commonly three weeks later. Introduced 1731.

6. *AMYGDALIS COMMUNIS* (common, sweet, and bitter Almond). *Blackw. t. 195. Lower serratures of the leaves glandular; flowers sessile in pairs.*—The COMMON ALMOND will grow to the height of near twenty feet, with spreading branches. The leaves resemble those of the Peach, but the lower serratures are glandular; they proceed from buds both above and below the flowers, and not as in the Peach from the ends of the shoots above and not below the flowers. The form of the flowers is not very different, but they usually come out in pairs, and vary more in their colour from the fine blush of the apple-blossom to a snowy-whiteness. The chief obvious distinction is in the fruit, which is flatter, with a coriaceous covering, instead of the rich pulp of the peach and nectarine, opening spontaneously when the kernel is ripe. The shell is never so hard, and is sometimes even tender and exceedingly brittle; it is flatter, smoother, and the furrows or holes are more superficial.

This tree is scarcely worth considering in England, for the sake of the fruit it produces. It is a great object in some parts of Italy, and in the South of France, and there are vast plantations of almonds in Provence and Dauphine. It is common in China, and most of the Eastern countries; and in Barbary where it is a native. It seems not to have been cultivated in Italy in the time of Cato, who calls the fruit *Nuces Græcæ*, or Greek nuts. With us, however, it is very valuable as an ornamental tree in clumps, shrubberies, &c. within view of the mansion, for it displays its delicate red-purple bloom in the month of March, when few other trees have either leaves or flowers. An almond-tree, covered with its beautiful blossoms, is one of the most elegant objects in nature.

In a forward Spring, they often appear in February; but, in this case, frost generally destroys them, and they bear little or no fruit: whereas, when the trees do not flower till March, they seldom fail to bear plenty of fruit, many of which will be very sweet and fit for the table when green, but they will not keep long.

Mr. Miller makes three species of the almond:—"1. *Amygdalus communis*, or common almond, which is cultivated more for the beauty of its flowers, than for its fruit. There are two varieties of this, one with sweet, the other with bitter kernels, which often arise from the fruit of the same tree.

2. *A. dulcis*, or *Jordan Almond*, the nuts of which are frequently brought to England; they have a tender shell, and a large sweet kernel. The leaves are broader, shorter, and grow much closer than those of the common sort, and their edges are crenate. The flowers are very small, and of a pale colour, inclining to white. I have several times raised these trees from the almonds which came from abroad, and always found the plants to maintain their difference from the common almond.

3. *A. sativa*, with narrow sharp-pointed leaves; flowers much smaller than those of the common almond, and white; the shoots of the tree smaller, and joints closer than those of the common sort; the tree is less hardy, and should therefore have the advantage of a warm situation, otherwise it will not thrive. This sort flowers early

in the spring, and rarely produces fruit in England. From an old tree which grew against a wall, having a southern aspect. The fruits have some years been ripe, well flavoured, but their kernels have been small."

[Duhamel gives seven species and varieties of the almond.

1. Common Almond, with a small fruit.

2. Sweet Almond, with a tender shell. *Amandier des Dames*. t. 1.

3. Bitter Almond, with a tender shell; only a variety of the foregoing.

4. Almond with a small fruit and tender kernel. *Amande-Sultane*; and, with a still smaller fruit, *Amande Pistache*.

5. Sweet Almond, with a large fruit, t. 2.

6. Bitter Almond, with a large fruit; only a variety of the foregoing.

7. Bitter Almond. Probably a variety of n. 1.

He has another which he calls *Amandier Pecher*, (t. 4.); and supposes to have been produced from the impregnation of the almond by the farina of the peach.

USES.—The kernel of the nut is the only part used which is tender, and of a fine flavour. The sweet almonds and other varieties are brought to the dessert in a green or imperfectly ripe state; they are also much used in cookery, confectionary, perfumery, and medicines. *Sweet almonds used in food* are difficult of digestion, and afford very little nourishment, unless extremely well comminuted. *As medicines*, they contribute by their soft unctuous quality, to blunt acrimonious humours in the first passages, and thus, sometimes, give present relief in heart-burns.

On expression, they yield near half their weight in oil, which is more agreeable than most of the common expressed oils, and is therefore employed medicinally for allaying acrid juices, softening and relaxing the solids, in tickling coughs, hoarseness, costiveness, nephritic pains, &c.

On trituration the almond with water, it unites with the fluid into an emulsion or milky liquor, which is prescribed as a diluent in acute diseases; and for supplying, in some degree, the place of animal milk, with which it has a great analogy.

An ounce of almonds forms an emul-

sion of a due consistence with a quart of water. Gum arabic is an useful addition in most cases. The pure oil mixed with a thick mucilage of Gum arabic forms a more permanent emulsion: one part of gum, with an equal quantity of water is sufficient for four parts of the oil.

Almonds are also useful medicines for uniting substances with water, which will not of themselves mix with it. Camphor, and the purgative and other resins, triturated with about six times their quantity of almonds, dissolve in water into a milky liquor, and are thus fit for being taken in a liquid form.

The oil of bitter almonds is not distinguishable from the other. The matter which remains after the expression of the oil, retains all the bitterness.

Bitter almonds, and emulsions made from them, have been recommended as aperients, resolvents, diuretics, and anthelmintics. The almonds taken freely in substance, occasion sickness and vomiting; in dogs, and some other animals, they are poisonous. A simple water, strongly impregnated with their volatile parts by distillation, has been found also poisonous to brutes, and there are instances of cordial spirits flavoured by them being poisonous to man.

It is probable, that the noxious matter is that in which its bitterness and flavour reside; and that the activity of this matter is increased by its separation from the gross oil and farinaceous substance by which it was enveloped in the kernel itself.

It is remarkable that the kernel of other fruit, that have any bitterness or particular flavour, appear to be impregnated with a substance of a similar nature to this poisonous principle of bitter almonds.

The fruit of the almond tree, after being properly dried, may be preserved in either bran or sand.

The sorts chiefly cultivated for use in this country are, according to Mr. Forsyth, the tender-shelled almond, the sweet-almond, the common or bitter almond, the sweet Jordan almond, and the hard-shelled almond. Those propagated only for ornament are the dwarf and the double-flowering almonds.

METHODS OF PROPAGATION, &c.—These are either by budding them upon plum, almond, or peach stocks, or by

sowing the stones of the fruit. It is observed in the "Universal Gardener," that in the first way they much sooner form full and regular heads, and attain the state of flowering and producing fruit; and that if it be intended to continue the *sweet kernelled*, or any other particular sort, it can only be effected with certainty by inoculation, as when raised from seed they are apt to vary, all the varieties often proceeding from the fruit of the same tree. This operation is generally performed about July or August, and may be done either for dwarfs, half, or full standards. Mr. Forsyth remarks, that the Spring after being budded, they may be trained for standards, or let grow for half-standards, but that the most common method is to bud them at such a height as the stem is designed to be; and the second year afterwards to plant them out for good. If they are to be transplanted into a dry soil, it is recommended to be done in October, when the leaves begin to decay; but, if into wet ground, in the month of February. Such as are budded on plum stocks are found to grow the best in wet soils, and those on almond and peach stocks in dry ones.

In raising trees of this kind from the stones, it is best to plant them in the early Autumn or Spring months, as October and November, or February and March, being careful to choose those of the last Summer's growth, drilling them in, in a bed of good light ground, two or three inches in depth. The plants appear in Spring, and in the Autumn or Spring following, may be transplanted into the nursery, and put in rows for the purpose of being trained for standards, half-standards, or dwarfs, according to the intention of the planter.

When it is intended to bud any of them with peaches or almonds, they will some of them be in a proper state for the operation; for dwarfs the first, and all of them the second Summer after transplanting; but for standards, in order to be trained with proper stems, they should constantly have three years' growth.

The dwarf sorts, besides being propagated by budding upon plum or almond stocks, may be easily raised by suckers from the roots, and by layers. The common method in pruning trees of this sort is, in the Spring, to shorten the first shoot from the bud to four or

five eyes, in order that the trees may put forth lateral shoots in proper quantity, so as to form regular full heads. But it is advised, by Mr. Forsyth, that when the young trees are brought from the nursery, they should never be cut till the young shoots begin to break; and that, after wet autumns, when the wood is not well ripened, hard winters are apt to kill the shoots, they should in such cases be cut down to the sound wood, care being taken to prune out all such cross shoots as rub against others, leaving the tree open in the middle, cutting the shoots about the same length as for apricots, and in proportion to their strength. The cankerous parts and decayed wood must always be wholly cut out and removed.

Whether made use of as standards or half-standards, it is recommended that they be planted in sheltered situations, which have a southern aspect. In some cases it may be necessary to protect them by some sort of light covering, against the injury that may be expected from the frosts in February and March. Trees of this sort are also sometimes planted against walls and on espaliers.

AMYGDALUS PERSICA (the Peach); see PEACH.

AMYRIS (from *a* intensive, and *myron*, balm; the whole of the trees in this genus smell strong of balm or myrrh).

Class 8. 1. Octandria Monogynia. Nat. Ord. *Amyrideæ*.

The Characters are—*Calyx* four-toothed; *petals* 4, oblong, spreading; *stigma* capitate; *berry* drupaceous, by abortion, one-seeded.

1. AMYRIS SYLVATICA (wood Amyris). *Leaves* ternate, crenate, acute.—A leafy branching shrub, from two to five feet in height, according to the soil and situation, abounding in a turpentine juice, of a strong disagreeable smell. It flowers in June and July. The berry is about the size of a pea. Gum elemi was formerly supposed to be yielded by this tree. A native of St. Domingo, Carthage, and St. Thomas, in shady woods by the sea-side. Introduced 1793.

2. AMYRIS MARITIMA (sea-side Amyris). *Leaflets* 3, sessile, odd, one-stalked, ovate, crenate, obtuse.—A shrub eight feet high, abounding in a juice that smells like rue. It grows naturally on calcareous rocky soil, by the sea-side, in the islands of Jamaica, Cuba, and

Hispaniola; flowering in June and July. Introduced 1810.

3. AMYRIS FLORIDANA (Florida Amyris). *Leaflets* 3, ovate, quite entire, obtuse, smooth.—A shrub ten feet high, with flowers somewhat panicked, and berries the size of black pepper, and of the same colour. Leaves resinous and fragrant. A native of Florida. Introduced 1826.

4. AMYRIS BRAZILIENSIS (Brazil Amyris). *Leaflets* veiny, shining above, discoloured beneath, lanceolate, quite entire.—A tree, native of Brazil. Introduced 1822.

5. AMYRIS RUMIERI (Plumiers Amyris, or gum-elemi tree). Plum. et Burm. t. 100. *Leaflets* 3-5, all stalked, somewhat serrated, ovate, acuminate, villous beneath.—Maregraff describes it as a lofty tree, twenty feet high, with a small trunk, covered with a smooth gray bark; growing almost in the manner of a beech-tree. *Leaves* sometimes ternate, sometimes pinnate, with two pairs and a terminating leaflet, and sometimes with two terminating leaflets; these resemble the leaves of the pear-tree, are three inches long, stiff like parchment, bright green, shining, acuminate, having one nerve running longitudinally, and several veins disposed obliquely. The flowers come out very close together at the axils of the leaves. The fruit is the size and figure of an olive, and the colour of a pomegranate, having an odoriferous pulp within it.

Gummi Elemi is a resin from this tree, brought over in oblong roundish cakes, generally wrapped up in flag leaves. The best sort is softish, somewhat transparent, of a pale whitish yellow colour, inclining a little to greenish. This resin is only used as an ingredient in a digestive ointment called *Unguentum Elemi*, which is made from one pound of gum elemi, ten ounces of turpentine, two pounds of prepared mutton suet, and two ounces of oil of olives. Native of Carolina and Brazil. Introduced 1820.

6. AMYRIS TOXIFERA (poison Ash or white candle-wood Amyris). Cat. Car. t. 40. *Leaflets* 5-7 stalked, ovate, somewhat cordate, acuminate.—Catesby describes his *poison-wood* as a tree with a light-coloured smooth bark. The mid-rib of the leaf as seven or eight inches long, and the pedicels as an

inch in length. The fruit as hanging in bunches, shaped like a pear, of a purple colour, covering an oblong hard stone. From the trunk a liquor distils as black as ink, which the inhabitants say is poison. Birds feed on the fruit. Native of Carolina, North America, as well as of the West Indies. Introduced 1820.

It is said to be a very valuable timber tree, the wood bearing a fine polish, and having a pleasant smell. The berries possess much of the taste of the balsam of Copaiva.

7. *AMYRIS PUNCTATA* (dotted-leaved Amyris). *Leaflets about 20 pairs, obliquely-oblong, crenulate, full of glandular dots.*—A shrub with small white flowers, the disk fleshy, bearing the petals and stamens. A native of the East Indies. Introduced 1818.

8. *AMYRIS HEPTAPHYLLA* (seven-leaved Amyris). *Rox. t. 28. Leaflets 3-4 pairs, obliquely-lanceolate, entire, acuminate, simple.*—A tree with whitish yellow flowers. The berry is oblong, one-celled, seed filling the berry. A native of the East Indies. Introduced 1822.

Amyris grows readily in a mixture of loam and peat; cuttings root freely in sand, under a hand-glass, those of the stove species in heat.

ANABASIS.

Class 5. 2. Pentandria Digynia. Nat Ord. *Chenopodeæ*.

The Characters are—*Calyx three-leaved; petals 5; berry one-seeded, surrounded by the calyx.*

1. *ANABASIS APHYLLA* (leafless Anabasis). *Without leaves; the joints emarginate.*—The stems are short and roundish; branches opposite, subdivided, and jointed; flowers opposite, sessile; berry very small, covered by the calyx, which is coriaceous, and becomes very large in a state of maturity; it is red, the pulp is watery, and dyes a yellow colour. The seed is ovate, compressed, lens-shaped, green, and fixed to the base of the pericarp, without any receptacle. It is a perennial plant, found wild on the shores of the Caspian. Introduced 1823.

2. *ANABASIS FOLIOSA* (leafy Anabasis). *Leaves subclavate.*—This species is seldom more than half a foot in height; more or less branched. Leaves sometimes alternate, sometimes three together, the two lateral ones smaller

than the other. These are surrounded with from six or seven to ten little flowers. Annual. Found wild on the shores of the Caspian. Introduced 1823.

3. *ANABASIS TAMARISCIFOLIA* (Tamarisk-leaved Anabasis). *Cavan. t. 283.* A shrub with white branches, very smooth. Leaves three-cornered, resembling those of the *Tamarisk*. Flowers subspliked, solitary, axillary. Calyx large. Germ conical, ending in an awl-shaped style, with three stigmas. Native of Spain. It grows well in a mixture of peat and loam; and cuttings strike root readily, under a bell-glass in sand. Introduced 1752.

ANACAMPSEROS (was the name of a plant to which the Ancients attributed the quality of restoring the passion of love, for which purpose it was used in incantations).

Class 11. 1. Dodecandria Monogynia. Nat. Ord. *Portulacææ*.

The Characters are—*Petals 5; sepals 2; capsule 3-6 valved, many-seeded; leaves having stipules; seeds winged.*

1. *ANACAMPSEROS ROTUNDIFOLIA* (round-leaved *Anacampseros*). *Bot. Cab. t. 591. Leaves ovate, smooth, green; peduncles round, long, panicled.* It grows low, and the flower stem is seldom of much size, though occasionally will have three or four blossoms, coming one after the other during the Summer. It is a neat looking little plant, but has been rather unfortunately bandied about for a name, being alternately called *Portulacca*, *Talinum*, *Rulingia*, &c. It requires a dry greenhouse in Winter, is easily propagated by cuttings, and may be potted in light loamy soil. A native of the Cape. Introduced 1732.

2. *ANACAMPSEROS ARACHNOIDES* (cobweb *Anacampseros*). *Bot. Mag. 1368. Leaves ovate, acuminate, diffuse, green, shining, cobwebbed; racemes simple; peduncles round, long.*—In this species the leaves, especially about the lower parts, are covered with a kind of web, and the woolly stipules, common to the whole genus, are mixed with longer and more robust threads; though shorter and finer than those of *A. filamentosa*, in which they resemble in degree fine shavings of horn, and are more than twice the length of the leaves. The flowers are white, with a delicate tinge of purple.

3. *ANACAMPSEROS RUBENS* (red-leaved

Anacampseros). *Leaves ovate, acuminate, difform, shining, cobwebbed, dark red; racemes simple; peduncles long.* A native of the Cape of Good Hope. Flowers red. Introduced 1796.

4. ANACAMPSEROS FILAMENTOSA (thready Anacampseros). Bot. Mag. 1367. *Leaves imbricated, expanded, dark green, cobwebbed, rugose above, threads axillary, longer than leaves.*—This plant was found by the late Mr. Masson, at Carro, beyond Hartequas Kloof. Flowers in August and September. It is about a foot in height, with pink flowers; requires the same treatment as the Cape species of Aloe.

5. ANACAMPSEROS LANCEOLATA (spear-leaved Anacampseros). *Leaves lanceolate, fleshy, convex beneath; scape leafy, short, one-flowered.*—The species are succulent, and grow freely in a sandy loam, mixed with a little lime rubbish, and require but little water. Cuttings root readily, but should be laid to dry a few days before being planted. Leaves taken off close to the plants, and laid to dry a few days, and then planted, will root, and shoot out young plants at their base.

ANACAMPTIS (to bend back, in allusion to the reflexed edges of the appendage of the pollen masses).

Class 20. I. Gynandria Monandria. Nat. Ord. Orchideæ.

The Characters are—*Corolla ringent, lip spurred on the underside at the base; glands of the pollen masses single, edges inflexed, enclosed in a pouch.*

ANACAMPTIS PYRAMIDALIS (pyramidal Anacamptis). Eng. Bot. t. 110. *Lip three-cleft; lobes equal, entire, with two longitudinal appendages on upper side near the base; segments of perianth, lanceolate, two outer ones spreading; spur filiform.*—Grows in meadows and pastures in a calcareous soil, more especially on chalky downs; seldom flowering before July. The whole herb is of a silky glossiness, and of an unspotted palish green. Spike dense, the buds erect; but as they open, the lowermost first, the flowers stand out horizontally, giving the spike a pyramidal form, which it loses again when all the flowers are expanded. The flowers are rarely found white. When drawn up in woods or among bushes, every part is more slender and straggling than in our figure.

ANACARDIUM.

Class 9. I. Enncandria Monogynia. Nat. Ord. Cassuviæ.

The Characters are—*Calyx five-parted; petals 5, reflexed; anthers 9, and filaments barren; not reniform, upon a fleshy receptacle.*

ANACARDIUM OCCIDENTALE (common Cashew nut). Blackw. t. 369. *Leaves coriaceous, subovate, shining, quite entire, petioled, scattered alternately.*—The Cashew is an elegant tree, twelve or sixteen feet high, spreading much as it rises, and beginning to branch at the height of five feet, according to Browne; but Long affirms, that in good soils it spreads to the size of a walnut tree, which it much resembles in the shape and smell of the leaves. The trunk seldom exceeds half a foot in diameter. Panicles corymbd, diffuse and terminating, containing numerous small red sweet-smelling flowers, sitting on an oblong receptacle, hardly to be distinguished from the peduncle; succeeded by an edible fruit of the pomegranate kind.

This fruit or apple has an agreeable sub-acid flavour, with some degree of astringency. Some of these are of a yellow, and others of a red colour, owing probably to some difference in the soil or culture. The juice fermented, yields a pleasant wine; and distilled, a spirit is drawn from it, far exceeding arrack or rum; making an admirable punch, and powerfully promoting urine. The dried and broken kernels are occasionally imported, for mixing with old Madeira, the flavour of which they improve prodigiously. Some planters in the West Indies roast the ripe fruit, or slice one or two into a bowl of punch, to give it a pleasant flavour. The astringency of the juice has recommended it as a very signal remedy in dropsical habits.

The nut springs from one end of the apple. It is of the size and shape of a hare's kidney, but is much larger at the end next the fruit, than at the other. The outer shell is of an ash colour, and very smooth; under this is another which covers the kernel, between these there is a thick inflammable oil, which is very caustic; this will raise blisters on the skin, and has often been very troublesome to those who have incautiously put the nuts into their mouths to break the shell. This oil has been used with great suc-

cess in eating off ring-worms, cancerous ulcers and corns; but it ought to be applied with caution. Some of the females have used this oil as a cosmetic, in order to remove the freckles and tan occasioned by the scorching rays of the sun; but it proves so corrosive as to peel off the skin, and cause the face to inflame and swell; but after enduring the pain of this operation for about a fortnight, their new skin, as it may be called, appears, fair like that of a new-born infant. The kernel, when fresh, has a most delicious taste, and abounds with a sweet milky juice. It is an ingredient in puddings, &c. When older it is generally roasted; and in this state is not so proper for costive habits. Ground with cocoa it makes an excellent chocolate. When kept too long, it becomes shrivelled, and loses its flavour and best qualities. The thick oil of the shell tinges linen of a rusty iron colour, which can hardly be got out; and if any wood be smeared with the oil, it prevents the wood from decaying. It would, therefore, be an excellent preservative to house-timbers, and ships' bottoms.

From the body of the tree is procured by tapping, or incision, a milky juice, which will stain linen of a deep black, that cannot be washed out again.

This tree also annually transudes from five to ten or twelve pounds weight, of a fine semitransparent gum, similar to gum arabic, and not inferior to it in virtue and quality, except that it has a slight stringency, which, perhaps, renders it in some respects more valuable. It is native of both Indies. Introduced in 1699.

The Cashew-tree is easily raised in its native country from the nut, &c., is of very quick growth, bearing fruit in two years after it is planted; but in England the plants are preserved with difficulty.

They are easily raised from the nuts, supplied annually from America in great plenty; each of these should be planted in a small pot filled with light sandy earth, and plunged into a good hot-bed of tanners' bark, being careful to prevent their having wet, till the plants come up, for the nuts frequently rot with moisture. Fresh nuts will yield plants in about a month; and in two months more these will be four or five inches high, with large leaves, but

these seldom advance much farther the same year.

The plants must be constantly kept in the stove, as they are too tender to live abroad in England, even in the warmest seasons. They should have little water in Summer, and in Winter water once in a fortnight will be sufficient, for their roots are tender and soon perish with moisture.

When these are transplanted, the pots should be broken, that the earth which cleaves to the roots may not be disturbed; and should then be put into larger pots filled with light sandy earth, and plunged into the hot-bed. They must not be removed oftener than once a year, and the pots should not be large, for unless their roots are confined, they will not thrive. With this management they may be kept for several years, but they seldom exceed two feet and half in height, and it is very rare to see them in England more than half that height.

ANACYCLUS (an abridgment of *Anathocyclus*, which was the name originally proposed by Vaillant, on account of the rows of ovaries without flowers, which are placed in a circle round the disk).

Class 19. 2. Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle paleaceous; pappus emarginate; pericarp with membranous edges.*

1. ANACYCLUS CRETICUS (trailing Anacyclus). Ann. mus. 11. t. 22. *Leaves bipinnate; leaflets oblong; stem procumbent.*

2. ANACYCLUS ORIENTALIS (oriental Anacyclus). Bot. Lug. 1, t. 110. *Leaves bipinnate; leaflets linear, subulate, flat; stem ascending; peduncles naked, terminal.*—These two species grow naturally in the islands of the Archipelago, from whence their seeds were sent by Tournefort to the royal garden at Paris: their seeds have been also received from Portugal. They are low plants, with branches trailing on the ground. The first sort has fine cut leaves, like those of Chamomile; the flowers are small, white, and grow single, with their heads declining, like those of the common May-weed. The second has leaves like those of the Ox-eye; the flowers are white, and like those of Chamomile. Introduced 1731—1759.

3. *ANACYCLUS AUREAU* (golden-flowered *Anacyclus*). Lam. Ill. t. 700, f. 2. *Leaves bipinnate, roundish, hoary, with excavated dots.*—This species is a native of the South of Europe and the Levant, and was cultivated here in 1570.

4. *ANACYCLUS VALENTINUS* (fine-leaved *Anacyclus*). Sch. ha. 3, t. 254, b. *Leaves decomposed, linear; segments divided, roundish, acute; heads floculose.*—This grows a foot and half high, sending out many side branches; the leaves are finely divided, and are hairy; the flowers are single at the end of the branches, and are of a bright yellow colour, with a silvery scaly calyx: they are as large as those of the Ox-eye. It is a native of Spain and Italy; flowering in June and July. Cultivated in 1656, by Tradescant.

5. *ANACYCLUS RADIATUS* (purple-stalked *Anacyclus*). Breyn. cent. t. 75. *Leaves three-pinnate; pinnae linear-subulate, downy; stem branched, divaricating; peduncles thick.*—A native of the South of Europe. Introduced 1596.

6. *ANACYCLUS CLAVATUS* (clubbed *Anacyclus*). Bin. cen. sic. 1, t. 7. *Leaves bipinnate, linear; peduncles inflated; grains winged.*—A native of Barbary, with white flowers. Introduced 1801.

All these plants are annual. The seeds should be sown early in the Spring in a border of light earth, where they are designed to remain, and require no other care, than to be thinned and kept free from weeds. They flower in July and August; and their seeds ripen in September.

ANADENIA.

Class 4. 1. *Tetrandria Monogynia*. Nat. Ord. *Proteaceæ*.

The Characters are—*Petals 4, regular; stamens sunk in the cavities of the limb; nectariferous glands none; stigma conical; follicle of one cell; seed solitary, without a wing.*

ANADENIA PULCHELLA (elegant *Anadenia*). *Leaves pinnatifid, slightly hairy; lobes wedge-shaped, three-cleft or pinnatifid at the extremity; spikes flowering from the top downwards; follicles glutinous.*—A shrub, native of stony hills in Lewin's land, on the south coast of New Holland. It requires the protection of a green-house during Winter.

ANAGALLIS.

Class 5. 1. *Pentandria Monogynia*.

Nat. Ord. *Primulaceæ*.

The Characters are,—*Capsule one-celled, cut round; corolla rotate; stigma capitate.*

1. *ANAGALLIS ARVENSIIS* (common Pimpernel). Eng. Bot. 529. *Stem procumbent; leaves three-nerved, ovate, lanceolate; petals dilated at end, crenate with glands.*—This beautiful little plant, whose sensitive flowers form the peasant's barometer, is frequently called the shepherd's weather-glass, because the corollas never expand in rainy weather, or when the air is moist, but on the contrary, when the atmosphere is dry and the sun shining, they display their scarlet and purple with happy effect, bespangling the earth with their bright eyes in the most agreeable manner, but which is regularly and firmly closed when Phœbus retires to the west.

The hollow winds begin to blow,
The clouds look black, the glass is low.
Closed is the pink-eyed Pimpernel,
'Twill surely rain, I see, with sorrow,
Our jaunt must be put off to-morrow.

This is one of the wonderful instincts of inanimate nature, for were it otherwise, the damps of the night air would prevent the discharge of the farina from the anthers, and this species of plants would be consequently lost to the link of nature's perfect chain, for although the Pimpernel is too lowly to excite the great interest of man, its seed is the food of insects who have their office to perform towards the completion of the general harmony of the globe.

The smaller kind of birds seek this seed with great avidity, and as it is a plant which follows cultivation, it may save a considerable quantity of the seed of the husbandman from the ravages of the feathered tribe.

Like the Poppy, the Pimpernel is generally found in ploughed grounds, and in gardens, particularly where the air is pure, and the soil light or sandy.

The common Pimpernel continues to give out a succession of blossoms, from the month of June to the end of September, and is, although a native weed, deserving of a situation on the parterre, its flowers being of a fine yellow scarlet, having a purple circle at the eye, which adds considerably to the beauty of this miniature flower; and as it is a delicate pretty flower, that we love to see in the small parterre, or on the banks

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or borders of the larger pleasure garden, we shall observe that it may be increased by cuttings, and when planted in a pot of light earth, and placed in a hot-bed, it will produce flowers in about six weeks.

This little plant, whose numerous branches spread themselves on the ground, being too weak to erect their flower stems, but which catch our attention by the vivid scarlet of the corolla, was formerly in great repute with medical practitioners; although it is now neglected in our practice. It was given in maniacal cases, and even in the hydrophobia, and also as affording relief in cancerous complaints. It appears, however, says Lewis, that it has some claim to the resolvent and detergent virtues ascribed to it by some writers.

2. *ANAGALLIS CÆRULEA* (blue *Anagallis*). Eng. Bot. 1823. *Leaves five-nerved, ovate, lanceolate, stem erect, a little winged; petals toothed at end.*—The petals of the blue-flowered Pimpernel have a spot of carmine colour at the base of each, in the same manner as the scarlet kind is marked by purple.

Old writers, after the ancient authors, distinguish these two kinds of *Anagallis* by calling the blue flowered the female, and the red the male, imperial.

Pliny remarks that sheep avoid the blue imperial, but eat the scarlet kind, which he considers as extraordinary, since the difference of the plants can only be perceived by the colour of the flowers. He adds, that when a sheep by accident has eaten of the blue pimpernel, the animal goes by instinct to a plant which he calls *Ferus oculus*. Schreber says, that sheep eat pimpernel readily. By the experiments in Amœn. acad., it appears that kine and goats feed on it, but that sheep refuse it. If Pliny is correct in his observation, both these opposite statements may also be accurate, since neither of them mention whether the experiments were made with the blue or the scarlet kind.

Mr. Miller says, "I have cultivated it for thirty years, and can affirm it never alters, and the plants, before they show their flowers, are so different as to be easily distinguished."

These two species of Pimpernel are propagated by the curious in British plants, by sowing the seeds soon after they are ripe, on a border of light earth.

The blue-flowered Pimpernel being more uncommon in the field, is naturally more desired in the garden.

3. *ANAGALLIS FRUTICOSA* (large-flowered *Anagallis*). Bot. Mag. 831. *Leaves lanceolate, about three together, sessile; stem shrubby at base, rounded; branches diffuse angular.*—In this splendid plant, the leaves are more lance-shaped, and less oval than in *arvensis*, the anthers, too, are pointed and incurved at the upper extremity. In the economy of the plants, there is a remarkable difference, for while the flowers of the *Arvensis* are never open except in fair weather; the flowers of the *fruticosa* pay so little regard to the changes of the atmosphere, that when once fully expanded, they remain open night and day.

It is readily propagated by cuttings, and will, if planted in the open ground, produce seeds; but to preserve it through the winter, must be entirely protected from frost. Introduced 1803.

4. *ANAGALLIS LATIFOLIA* (broad-leaved *Anagallis*). Bot. Mag. 2389. *Leaves cordate, stem-clasping; stem branchiate, erect.*—*Anagallis latifolia* is distinguished from *A. Monelli* by having broader, more obtuse and nerved leaves; by the petals being more orbicular, with quite entire margins and crowded closer together; by the calycine segments being too short to appear in sight, as they do in *Monelli*; and by the stem appearing flattened by two of the angles being much larger and more obtuse than the other two. It is a trailing annual plant; flowering in July. Native of Spain. Introduced 1759.

5. *ANGALLIS MONELLI* (blue Italian Pimpernel). Bot. Mag. 313. *Leaves linear, lanceolate, opposite or whorled; stems ascending.*—In Italy and Spain, where this plant grows spontaneously, it is an annual, producing seed in abundance; with us (as far at least as we have observed) it produces no seed, but like the *Senecio elegans*, and some other annuals, is renewed and rendered perennial by cuttings, which strike freely, and by which the plant requires to be renovated once or twice in the season; though described as growing with an upright stem, it requires to be tied up to a stick; and if this be neatly and dexterously done, its brilliant azure flowers springing from every side of the stem render it a charming ornament for

the green-house or window; it flowers during most of the year. On the same plant we find the leaves grow two, three, or four together with flowers corresponding. Introduced 1648.

6. *ANAGALLIS TENELLA* (bog pimpernel). Eng. bot. t. 530. *Leaves ovate, acute; stem creeping; stigma acute.*—This most elegant little plant is not unfrequent on wet bogs throughout these kingdoms, flowering in July and August. The flowers are erect, on very long, axillary, solitary stalks. The corolla of an elegant rose colour, is deeply divided. The stamina are clothed with numerous and curiously jointed hairs. It being a bog-plant, it cannot be cultivated in gardens without a situation proper for it; though it will flower well enough in pots of bog earth plunged in water.

ANAGYRIS (from *ana*, backwards, and *gyros*, a circle; in allusion to the pods being curved backwards at their extremities).

Class 10. 1. Decandria Monogynia.

Nat. Ord. *Leguminosæ*.

The Characters are,—*Calyx five-toothed, two-lipped; keel of two petals, which are longer than the wings, and are longer than the standard; pod compressed, many seeded.*

1. *ANAGYRIS FORTIDA* (stinking Bean-Trefoil). Bot. Cab. 740. *Leaves lanceolate, acute.*—It grows wild in the South of France, Spain, Italy, and Sicily, and also about Smyrna. It rises to the height of eight or ten feet, and produces its flowers in April and May; they are of a bright yellow colour, growing in spikes, somewhat like those of the laburnum. The leaves have an unpleasant smell, whence its name: they are usually deciduous, but when well protected, sometimes remain through the winter. The seeds are never perfected in this country, and therefore it is scarce in England. It was cultivated in 1570.

2. *ANAGYRIS LATIFOLIA* (broad-leaved Bean-Trefoil). *Leaves elliptical, obtuse.*—It rises to the height of six to ten feet, with yellow flowers; the legumes are torose and obtuse; flowers in April and May. Native of Teneriffe. Introduced 1815.

CULTURE.—These plants may be propagated by laying down their tender branches in the Spring, tugging them in the same manner as the layers of

carnations, and watering them in dry weather. By this management the layers will take root by the following Spring, and should be cut off from the old plants before they begin to put out their leaves, and planted in a warm situation.

If the plants are propagated from seeds, they will be much handsomer, and rise to a greater height. For this purpose the seeds should be sown in a moderate hot-bed in the beginning of March, or in a border of good rich earth, in a well-sheltered place, sifting over them about half an inch of fine mould, and covering them with a common frame, in order to protect them in severe weather. When the seeds are good, the plants will appear in a month after the seeds are sown; they should then be inured by degrees to the open air, and removed into a sheltered situation towards the end of May. With this view the seeds may be sown in pots, and plunged in a hot-bed, because the plants will not bear transplanting till the following Spring; and it will be proper, during the two first winters, to shelter them under a common frame, the glasses of which may be drawn off every day in mild weather, that the plants may be thus prepared for being planted abroad, when they have acquired proper strength. They should be kept in pots for three years, and they will then be fit for removal to the places where they are to remain; the best time for which is about the beginning of April, just before they begin to put out new leaves. At this time they should be turned out of the pots with good balls of earth to their roots; and some of them may be planted against walls with warm aspects, so as to be secure from the frost; and others in warm situations, where, by covering the surface of the ground about their roots with tanners' bark in severe winters, and screening their heads with mats, they may be preserved for several years. In the fourth year from sowing these plants will begin to produce their flowers, and will continue flowering every year; and they will be proper for intermixing with other flowering shrubs of the same growth in warm situations.

ANARRHINUM (named by Desfontaines in contradistinction to *Antirrhinum*, because the plants of this genus have not the snout-like flowers of the latter).

Class 14. 2. *Didynamia Angiosperma*.

Nat. Ord. *Scrophularinæ*.

The Characters are,—*Calyx five-leaved; corolla prominent at base, honey bearing; lower lip flat, without a prominent palate; capsule two-celled, many valved.*

1. *ANARRHINUM BELLIDIFOLIUM* (Daisy-leaved *Anarrhinum*.) Bauh. prod. t. 106. *Very radical; leaves obovate, lanceolate, blunt, serrate; cauline divided, entire.* A hardy annual, or at most biennial. It sometimes attains the height of two feet, and is branched. Flowers from June to October. Native of France. Introduced 1629.

2. *ANARRHINUM PUBESCENS* (pubescent *Anarrhinum*.) Native of Mount Sinai; flowering from June to August. Introduced 1826.

Sweet observes "*Anarrhinum* may be sown in the open borders, and must be treated as other hardy biennials."

ANASTATICA (from *anastasis*, resurrection; plant recovering its original form, however dry it may be on immersion in water).

Class 15 *Tetradynamia Siliculosa*.

Nat. Ord. *Cruciferae*.

The Characters are,—*Silicle ventricose, with valves bearing an appendage outside at the end.*

1. *ANASTATICA HIERICUNTA* (common *Anastatica*, or Rose of Jericho). Cam. Hort. t. 41. *Leaves obtuse, spikes axillary, very short; silicles, hoofed, thorny.*—This plant grows naturally on the coasts of the Red Sea; in Palestine and near Cairo, in sandy places. The stalks are ligenous though the plant is annual; it rises five or six inches high, dividing into many irregular branches; leaves fleshy and glaucous. The flowers, which are small and white, are disposed in short spikes at the wings of the stalks, and have little beauty; these are succeeded by short prickly pods, having two cells, in each of which are two seeds. It is preserved in botanic gardens for the variety, and in some curious gardens for the oddness of the plant, which, if taken up before it is withered, and kept entire in a dry room, may be long preserved; and after being many years in this situation, if the root is placed in a glass of water a few hours, the buds of flowers will swell, open, and appear as if newly taken out of the ground, or it will re-

cover its original form in the same manner if wholly immersed in water. Cultivated in 1656, by Tradescant.

It has had the epithet of *Rosa Marie* given to it by the Monks, who have superstitiously imagined that the flowers opened at the instant our Saviour was born. In Palestine, the plant is called *Kaf Maryam* or *Mary's Flower*.

This species being annual, can only be propagated by seeds, which rarely ripen in England, unless they be sown on a hot-bed in the spring, and the plants afterward put into pots, which should be plunged into another hot-bed to bring them forward; for although the seeds will come up in the full ground where the soil is dry, yet the plants rarely rise to any size, nor do they perfect seeds unless the summer is very hot and dry; but if they are kept in a frame, with free air in warm weather, they will flower in June, and the seeds will ripen in September.

ANCHIETIA.

Class 5. 1. *Pentandria Monogynia*.

Nat. Ord. *Violariæ*.

The Characters are,—*Calyx deeply five-parted, unequal; lower petal large, unguiculate, with a spur at the base; anthers almost sessile; two lower ones on very short filaments, each drawn out into a filiform appendage on the back; capsule large, inflated, many seeded.*

1. *ANCHIETIA PYRIFOLIA* (pear-leaved *Anchietia*). Mart. Bras. t. 16. *Leaves ovate, acute, crenated; labellum obovate; spur incurved.*—A climbing shrub, with whitish flowers, veined with red at the base; flowering in July and August. Native of Rio Janeiro. Introduced 1826.

2. *ANCHIETIA SALUTARIS* (Salutary *Anchietia*). *Leaves ovate, acute, crenated; labellum ovate; spur incurved.*—A shrub six feet high; flowers whitish, in axillary fascicles; the roots are used with success as a cathartic in eruptions of the skin. Native of Brazil.

These shrubs may be grown in a mixture of loam sand, and peat; and young cuttings will root freely under a bell glass, if planted in sand and placed in a moderate heat.

ANCHUSA.

Class 5. 1. *Pentandria Monogynia*.

Nat. Ord. *Boraginæ*.

The Characters are,—*Calyx five-cleft, persistent; corolla funnel-shaped, with a half five-cleft, spreading limb; ovary*

closed, with five prominent scales; anthers included; stigma emarginate; seeds gibbous, with a sculptured surface.

1. *ANCHUSA BARRELIERI* (Bartelieri's Bugloss). Bot. Mag. 2349. *Leaves oblong, entire, narrowed at both ends, with the simple stem hispid; peduncles trifid.* A hardy perennial; flowering in May. Native of Italy, and the South of France. Introduced 1820.

2. *ANCHUSA ITALICA* (Italian Bugloss). Bot. Reg. 483. *Leaves lucid and strigose; racemes two-parted, two-leaved; flowers somewhat unequal, bearded at the throat.*—The *Anchusa Italica* is not desirable merely for the brilliant colour of its flowers, but also for the succession of them during several months. The first, or spring stems, yield their blossoms through great part of June and July. During these months another progeny will shoot forth to succeed them in gay luxuriance; until the icy hand of autumn crushes all their beauty. It differs from the *A. Officinalis*, in size, in that the flowers are equal and funnel-shaped; whereas in this they are salver-shaped; they are much more imbricate, in that the segments of the calyx being broader and shorter; those of the corolla ovate; with the scales of the throat only slightly tomentose. Native of the South of Europe. Introduced 1597.

3. *ANCHUSA CAPENSIS* (Cape Bugloss). Bot. Rep. 336. *Leaves lanceolate, callos, villous; racemes trichotomous.*—This is the only species of the genus we have yet from the Cape of Good Hope. It was first discovered by Thunberg, and flowered for the first time in England in the month of July, 1803, having been sent home by Mr. Nixen from the Cape in 1800. It is a hardy green-house plant, rather short lived; growing freely in a mixture of loam and sandy peat.

4. *ANCHUSA RUPESTRIS* (rock Bugloss). Pall: it. t. E. f. 3. *Leaves linear, lanceolate, villous; racemes alternate.*—Native of Siberia; flowering in July. Introduced 1802.

5. *ANCHUSA ANGUSTIFOLIA* (narrow-leaved Bugloss). Bot. Mag. 1897. *Racemes nearly naked in pairs.*—In gardens it grows to the height of two feet, but in its wild state does not attain more than a foot. The leaves are narrow, and not so hairy as the *Officinalis*; the spikes of flowers are double, and have no

leaves; the flowers are small, and of a red colour; the roots will continue three or four years in poor land. It is found wild in Italy, Germany, and Switzerland; flowers in July and August, by way sides, and in the borders of ploughed lands; cultivated here by Miller in 1759. Boerhaave recommended the juice in the pleurisy and maniacal cases. It is propagated by seeds, being only biennial.

6. *ANCHUSA MILLERI* (pink Bugloss). *Leaves oblong, toothed, hispid, the lower stalked, the upper sessile; flowers single, lateral; stems diffuse.*—Native of the Levant. Flowers in May and June Introduced 1713.

7. *ANCHUSA PANICULATA* (panicked Bugloss). Fl. Græc. 163. *Leaves lanceolate, strigose, entire; panicle dichotomous; flower stalked; calyx five-parted, subulate.*—It is biennial. Flowers in May and June. Native of Madeira, where it was found by Mr. F. Masson, and introduced into Kew Gardens in 1777.

8. *ANCHUSA TINCTORIA* (dyers' Bugloss). Bot. Rep. 576. *Leaves oblong; bractes longer than the five-parted calyx; valves of corolla, shorter than stamens.* Dyers' Bugloss is indigenous to Italy, Spain, and the South of France. It is cultivated in the latter place to some extent for the sake of the roots which, (when in perfection) are externally of a deep purplish red colour. The red cortical part, separated from the whitish woody pith, imparts a fine deep red to oils, wax, and all unctuous substances, and also to rectified spirits of wine; but to water it gives only a dull brownish hue. The spirituous tincture, when inspissated to the consistency of an extract, changes its fine red to a dark brown. The root has little or no smell, and scarcely any taste; extracts made from it, by water and by spirit, are bitterish and roughish, but in too low a degree to be regarded as medicines, though they were formerly in repute as aperient, for dissolving coagulated blood, restraining diarrhoeas, and drying inveterate ulcers. Its chief use at present is for colouring oils, plasters, lip-salves, &c., which receive a fine deep red from one-fortieth their weight of the root. For this purpose the consistent unctuous materials are to be liquefied in the heat of a water-bath, the powdered anchusa

added, the mixture stirred now and then till sufficiently coloured, and then strained through a linen cloth. The roots of bugloss boiled in a decoction of Brazil wood are sometimes substituted for those of alkanet; but these will not dye oils red.

Anchusa and *Cinnabar* were used by the ancients to give an agreeable colour to their ointments; and Pliny tells us that where the *anchusa* was used, they added salt to prevent the oil in those compositions from becoming rancid. This root was also in request by the Romans for colouring wood and wax, as well as to satin wool that was to be afterwards dyed of their expensive purple colour, and for this purpose the roots were taken up about the time of wheat harvest, when they were full of a red juice. This author adds, that if a person who has chewed this plant should spit in the mouth of a venomous creature, he would kill it.

Our apothecaries are principally supplied with these roots from Languedoc and Provence. This species was cultivated in England previous to the year 1596. It prospers best in a sandy soil, and in a warm situation.

9. *ANCHUSA VARIEGATA* (variegated Bugloss). Fl. græc. t. 178. *Leaves repand; spinulosely-toothed callose; stem decumbent; corolla cernuus.*—The root is annual; and the flower elegantly variegated. Native of the Levant. Introduced 1683.

10. *ANCHUSA PARVIFLORA* (small-flowered Bugloss). Fl. græc. t. 167. *Leaves linear, obtuse, hispid; calyx five-parted, strigose; seeds hemispherical, rugose.*—Native of the Levant. Flowers blue. Introduced 1827.

11. *ANCHUSA CÆSPITOSA* (tufted Bugloss). Fl. græc. t. 169. *Leaves linear, obtuse, rough, spreading, longer than the stalk; racemes few-flowered; calyx five-parted.*—It is perennial; the flowers are of a very vivid blue colour, and for the size of the plant, rather large. Native of the Levant. Introduced 1826.

12. *ANCHUSA OCHROLEUCA* (pale-flowered Bugloss). Bot. Mag. 1608. *Leaves linear, lanceolate, coarsely dotted, hispid; calyx in fruit campanulate nodding.*—This species of Bugloss, which has sometimes been considered as a variety of *Officinalis*, is a native of the Caspian Caucasus, and of the neigh-

bourhood of the Volga, growing among the herbage in the open champaign countries; and flowers in July and August. Biennial; propagated by seeds, or parting the roots in autumn. Introduced 1816.

13. *ANCHUSA UNDULATA* (waved-leaved Bugloss). Bot. Mag. 2119. *Strigose; leaves linear, toothed; stalks less than bractææ; calyx in fruit inflated.*—This plant is three feet high, with many strong lateral branches, produced from the main stem near the ground. The leaves are stiff, rough, six or seven inches long, and about half an inch round at the top, closely embracing the branches at the base, and two inches broad, indented and waved on their edges, the upper surface beset with hairs, and very rough to the touch. Spikes of flowers axillary, a foot or more in length, reflex. Corollas fine blue. The root commonly decays after the seeds are perfected; though sometime, when it grows upon gravel, or in the joints of stone walls, it will live three or four years. Such plants are seldom more than a foot high, and have small narrow leaves; so that they appear like a different species. It is a native of Spain and Portugal. Gmelin also found it in Siberia. Cultivated in 1739, by Mr. Miller.

14. *ANCHUSA OFFICINALIS* (common Bugloss). Eng. Bot. 662. *Leaves lanceolate, strigose; spikes one-sided, imbricated; calyx long as tube of corolla.*—This is perennial. The stem is about two feet in height, erect, angular, foliose, somewhat branched and panicle, the root is fusiform, and externally black; the herb is hairy and rough; the leaves are lanceolate, acute, and slightly decurrent; the upper ones subovate at the base; the racemes are mostly double and revolute; the bractæes ovate, and not as in the *A. angustifolia* linear-lanceolate; the flowers purple and funnel shaped. It grows wild in Italy, Spain, France, Germany, Sweden, Denmark, and Siberia, by road sides and in corn-fields. It is found also with us amidst rubbish or in marshes; as on the links near Hartly Pans in Northumberland. When it is tender in the Spring, it is boiled and eaten in Upland. The tube of the corolla is melliferous, and the bees are very fond of it. This is not the *anchusa*, but the bugloss of officinal writers; but it does not appear

that our bugloss possesses the same properties with that of the antient; for it has no claim to the title of *euphrosynum* given to theirs (see Pliny, Hist. Med. lib. 25. c. 8.), as it has no exhilarating quality, although its flowers have been long referred to the class of the four cordials. This plant, says Dr. Lewis, (Mat. Med. p. 167.) appears to be nearly similar to borage, in its medicinal qualities as well as in its external form. The principal difference seems to consist in the leaves being somewhat less juicy, and the roots more mucilaginous. The roots, leaves, and flowers are ranked among the articles of the *materia medica*, but they are very seldom used. In China, this plant is said to be much esteemed for gently promoting the eruption in the small pox.

The Bugloss has been made the emblem of falsehood, because its roots are used in making rouge for the face. And why not? says the faded fair one,

“ Les ruines d’une maison

Se peuvent réparer que n’est cet avantage
Pour les ruines du visage ?

La Fontaine.

The good taste displayed by the British ladies of the present day in throwing aside the barbarous practice of disfiguring the *contour* of the countenance by a composition mask, or an unnatural stain, must be acknowledged by every one whose memory is a quarter of a century old.

Nothing more decidedly indicates an approach to the most refined state of civilization in any country or people than that of the throwing off the disguise of art, and following the beauties of nature, whose works none can correct, or make more perfect. And notwithstanding that the painting of the face has been sanctioned by all the courts of Europe, its origin was derived from the most uncivilized part of mankind.

In some mode or other this art has been employed in all quarters of the globe, and as each nation considers the customs of those who differ from themselves in the manner of disguising their persons as ridiculous, it proves the absurdity of the practice.

Madame de Latour observes that from north to south, from the east to the west, amongst savage people, and in civilized nations, the taste for painting is universal. The wandering Arab, the sedentary Turk, the beautiful Per-

sian, the small-footed Chinese, the blooming Russian, the phlegmatic English, the indolent Creole, and the lively trifling French woman, all wish to please, and all like to do so by painting themselves. In the deserts of America, the savages paint their bodies with the root of a species of Bugloss, that is indigenous to their country. The antient Britons painted their bodies of a blue colour. Duperron tells us that a young savage girl, who wished to attract his attention, took slyly a piece of coal, and retiring to a corner, pounded it, and blacked her cheeks with the powder, then returning with a triumphant air, as if this ornament had rendered the effect of her charms more secure.

Galen notices the use of the Bugloss root as a cosmetic in his time, and the rouge made from this plant is said to be the most antient as well as the most innocent of all the paints that are prepared for the face, and it is also said to possess considerable advantage over other kinds of rouge, as it lasts some days without rubbing off, and water renews it in a similar manner, as it refreshes the natural colour, and we are farther assured that it does not wither the skin so much as the other kinds of rouge, but we would add that all kinds of paint for the face are dangerous, for however delicately it may be used in the first instance, it is sure to increase, although imperceptibly to the wearer, until it becomes a perfect mask. We remember several Ladies, who, from having been accustomed to the use of rouge from an early age, increased the colour from year to year, until their cheeks were but a few degrees behind those of a clown in a Christmas pantomime. Some years back we wished to pay our respects to a lady of rank on the day of her arrival at a sea-side hotel, where, on enquiring for Lady Sarah C —, we were asked if it was the lady with a striped face; the question would have been an enigma, had not a door opened at that moment, which presented Lady Sarah, with her cheeks as regularly striped as the flanks of a zebra hide, which had been occasioned by her ladyship's having ridden the last stage in an open carriage, and exposed to the beating of the rain in her face. This story will not appear exaggerated when we relate, that habit has induced some people to take lavender-water as a sub-

stitute for spirit, and others to use coloured tooth-powder for want of rouge. But these misfortunes are nearly at an end, and the youthful fair begin to know that,

"Rien n'est beau que le vrai, le vrai seul est amiable."

These plants flower from the end of May to the end of September, but they have no great beauty to recommend them to a situation in the parterre.

ANDERSONIA (named by Mr. Brown, in memory of Mr. W. Anderson, surgeon, who accompanied Captain Cook in two of his voyages, in the last of which he perished).

Class 5. 1. Pentandria Monogynia. Nat. Ord. *Epacrideæ*.

The Characters are—*Capsule, with placentas attached to a central column; calyx, coloured with two or more leafy bractæ; corolla the length of the calyx; the segments of the limb bearded at the base; stamens hypogenous, sometimes connate.*

ANDERSONIA SPHRENGELIOIDES (sphrengelia-like Andersonia). Bot. Mag. t. 1645. *Leaves spreading, with a flat point.*—It differs from *sphrengelia* chiefly in the existence of scales at the base of the germen, which are wanting in the latter genus, and in the greater length of the tube of the corolla, with laciniae bearded at the base. A hardy green-house shrub; discovered on the Southern coasts of New Holland, by Mr. Brown. Introduced in 1783.

According to Sweet, this genus grows freely in sandy peat soil, with the pots well drained; and care should be taken not to overwater it, as they are very liable to get sodden, when they seldom recover. The very young tops put in for cuttings, under a bell-glass, in sand, will root readily. When first potted off, they should be put singly in small thumb-pots, and kept close in a frame for a few days, and hardened to the air by degrees.

ANDIRA (the Brazilian name of some of the species).

Class 17. 4. Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx five-fid; drupe ovate; kernel compressed.*

1. ANDIRA INERMIS (bastard cabbage tree). Phil. Trans. 1777, t. 10. *Unarmed; leaflets ovate, lanceolate.*—The cabbage-bark tree, or worm-bark tree, grows in most parts of Jamaica, and

particularly abounds in the low Savannas of St. Mary and St. George. It rises to a considerable height, but to no great thickness, sending off branches towards the top of a straight, smooth trunk. The leaves are, when young, of a light green hue; when full grown of a dark green; and before they drop, of a rusty appearance.

The flower-spike is long, and beautifully branched. The flowers are numerous; their calyxes of a dark purple; their petals a pale rose colour. The nectaria (Dr. Wright observes) must contain much honey, as thousands of bees, beetles of various kinds, butterflies and humming birds, are continually feeding thereon.

The pericarpium is a green hard fruit, of the size of the smaller plum. The skin is of the thickness of a crown piece; and tastes very austere. The kernel is covered with a brown skin, like that of other nuts; it is very hard, and tastes astringent.

The wood is hard, and takes a good polish. It is, however, fit only for rafters, or other parts of small buildings; but this tree is valued chiefly for its bark, which externally is of a grey colour, and the inside black and furrowed. Fresh cabbage-bark tastes mucilaginous, sweet and insipid. Its smell, however, is rather disagreeable, and it retains it in the decoction; hence by some called the *bilge-water tree*.

The bark was first noticed as a vermifuge by Peter Duguid; but Dr. Wright, who resided a long time in Jamaica, has communicated the fullest information concerning this tree. According to him the bark is powerfully medicinal; its anthelmintic effects have been established at Jamaica by long experience. It is given in the form of powder, decoction, syrup and extracts, but should always be given in small doses. The decoction is preferred, and is made by slowly boiling an ounce of the dried bark in a quart of water until it assumes the colour of Madeira wine. This sweetened is the syrup; evaporated it forms the extract. Cultivated 1773.

2. ANDIRA RACEMOSA (racemed Andira). *Leaflets 13, ovate-oblong, acuminate, glabrous on both surfaces; fruit obovate, globose.*—A tree, twenty to sixty feet in height; the flowers in panicle racemes. Native of Cayenne. Introduced 1818.

The species of *Andira* grow freely in sandy loam, or a mixture of loam and peat. Cuttings will strike root if planted in sand, with a hand-glass placed over them in heat.

ANDRACHNE (the Greek name of the Purslane: the modern plant bears some analogy to that of the Greeks, in its thick and fleshy leaf).

Class 21. 8. Monœcia Gynandria. Nat. Ord. *Euphorbiaceæ*.

The Characters are—*MALE calyx*, five leaved; *petals* 5; *stamens* 5, inserted into the rudiment of a style. *FEMALE calyx*, five-leaved; *cor.* 0; *styles* 3; *capsule* three-celled; *seeds* 2.

ANDRACHNE TELEPHIOIDES (annual bastard Orpine). Lam. Ill. t. 797. *Procumbent herbaceous*.—This is a low plant, with its branches trailing on the ground. The leaves are small, oval, smooth, and of a sea-green colour. It is found wild in some parts of Italy, and in the Archipelago, from whence Tournefort sent the seeds to the royal garden at Paris: but being a plant of no great beauty, it is seldom cultivated, except in botanic gardens for variety. It was cultivated in 1732, by James Sherard, M.D.

If the seeds of this plant are sown on a moderate hot-bed in March, they will arise in about a month after, when they may be transplanted each into a small pot, and plunged into another very moderate hot-bed; in mild weather they should have plenty of air admitted to them, and be often refreshed with water: in June they will produce flowers, and the seeds will ripen in August and September, after which the plants decay.

ANDREOSKIA (in honour of A. Andrzejsk, a Russian botanist).

Class Tetradynamia Siliquosa. Nat. Ord. *Cruciferaæ*.

The Characters are—*Siliqua* rather terete, sessile; *valves* somewhat convex; *style* short, slender; *calyx* equal at the base.

1. **ANDREOSKIA INTEGRIFOLIA** (entire leaved Andreoskia). *Leaves* linear, quite entire. In this species the flowers, which vary from white to purple, are produced in June and July. It is a native of the arid fields of Dauria, and introduced here in 1819.

2. **ANDREOSKIA PECTINATA** (pectinated Andreoskia). *Leaves* pectinately pin-nate-lobed.—A plant, three to six inches

in height; flowers the same as those of *A. integrifolia*, but a little larger. There are several varieties of this species. Native of Dauria. Introduced 1827.

These plants require to be sown in the open ground, and treated like other hardy annuals. A light sandy soil will suit them best.

ANDROCYMBIUM.

Class 6. 3. Hexandria Trigynia. Nat. Ord. *Melanthaceæ*.

The Characters are—*Sepals* 6, unguiculate, cucullate; *stamens* inserted in the middle of sepals; *ovaries* 3; *styles* filiform.

ANDROCYMBIUM EUCOMOIDES (dwarf or tulip-leaved Androcymbium). Bot. Mag. 641. *Leaves* oblong, lanceolate, cucullate.—In this very curious species the bulb is tunicated, ovate, and dark brown; *caudex* sometimes wholly underground, and nearly obsolete, at other times 3-4 inches above it, covered by the imbricate cowed equitant bases of the leaves, which are 4-6 or even more, alternate, distich, oblong-lanceolate, recurved, smooth, and somewhat shining, with a middle longitudinal furrow the upper ones ovate-lanceolate, sheathing the 1-8 flowered umbel by the sinus formed of their cowed bases; *peduncles* one-flowered, hid by the leaves; *corolla* terminal, somewhat herbaceous; *petals* campanulately radiating from the crown of the peduncles; *ungues* thick, fleshy, compressedly columnar; *laminæ* sub-membranous, streaked, incurved at their summit, and sub-gibbous outwards; rolling inwards they embrace the bases of the filaments, which are brown, tumid, and stand on the upper extremity of the unguis, incurved round, the length of laminæ and styles; *anthers* linear-oblong, purplish brown above the points of the petals; pollen yellow; *styles* patent upwards; *stigmas* small brown points; *seeds* about the size of mustard.

Sweet observes, "the bulbs are so exactly similar to that of a tulip, that we believe no person would be able to recognise the difference, without previous knowledge, and it requires precisely the same sort of treatment; the best soil is an equal portion of light turfy loam, peat, and sand; they should be put in the ground early in Spring; after they have done flowering, and the stems are beginning to be dried up, the

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bulbs must be taken out of the ground, and laid to dry out of the reach of frost until the following Spring."

Native of the Cape of Good Hope. Introduced 1795.

ANDROMEDA (named in allusion to the virgin Andromeda, who, like this plant, was confined in a marsh, and surrounded by monsters of the waters).

Class 10. 1. Decandria Monogynia. Nat. Ord. *Ericææ*.

The Characters are—*Calyx five-part-ed; corolla ovate, with a five-cleft orifice; capsule five-celled; valves contrary to the dissepiment.*

1. ANDROMEDA HYPNOIDES (moss-like Andromeda). Fl. dan. 10. *Leaves imbricated, subulate, smooth; peduncle solitary, terminal; corolla globose, campanulate.*—A native of Canada, as well as Lapland and Siberia; where it spreads over large tracts of ground, adorning them with its beautiful red flowers, which are produced in April and May. It is somewhat difficult of cultivation, succeeding best potted in black peat earth, covered with a bell-glass, and put in a shady place. It may be increased by cuttings.

2. ANDROMEDA POLIFOLIA (marsh Andromeda). *Peduncles aggregate; corolla ovate; leaves alternate, lanceolate, revolute. α latifolia* (broad leaved); *leaves oblong. β media* (wild rosemary); *leaves lanceolate. γ angustifolia* (narrow leaved); *leaves linear, lanceolate. δ subulata* (awl-leaved); *leaves subulate.*—An elegant little shrub, growing on most peat bogs in the mountainous parts of England and Ireland, and lowlands of Scotland, intermingled with *Erica*, *Vaccinium*, &c. Flowers in June. It rises from six or eight inches to a foot in height, erect and branched; the flowers are fleshy and nodding, the calyx is red, the corolla of a pink colour, the anthers awned, the capsule erect and five-furrowed, the style white, with a purple stigma, and the seeds very many and small. It is a native of America and the northern countries of Europe on turf bogs. It flowers about the end of May; and is called *Mars Chistus*, *Wild Rosemary*, *Poley Mountain*, *Moorvoort*, and *Marsh Holy Rose*.

There is some difference in the varieties as found in North America, in Europe and in Newfoundland, and Labrador. Linnæus in his elegant and instructive *Flora Lapponica* has, with

his usual fancy, explained his reason for naming this plant *Andromeda*. The passage is too long to copy, and it would require his taste to do justice to it in a translation, but nothing can be more poetical than the original.

3. ANDROMEDA CALYCVLATA (various leaved Andromeda). Pall. ross. 2. t. 72. f. 1. *Peduncles solitary, axillary, one-sided; bractes 2; leaves oval, scaly, dotted, obsoletely serrated.*—This pretty evergreen shrub, with some trifling variations in its growth, is found native nearly all round the northern parts of the globe; as in Siberia, Sweden, and North America, growing on mossy lands.

The severest cold will not affect it, but it is desirable with this, as with most others of the northern plants, that they be kept somewhat shaded during our hot months.

It should be planted in a mixture of peat and fresh loam, and may be propagated by layers, which will be sufficiently rooted for separation in two years.

4. ANDROMEDA JAPONICA (Japan Andromeda). Thunb. Jap. t. 22. *Racemes one-sided, panicled, terminal; leaves lanceolate, obovate, acute, serrulate at end.*—This is a tree, a native of Japan, near Nagasaki, and flowers in December. It requires to be grown in a sandy peat; and cuttings, not too young, should be planted in sand, under a bell-glass).

5. ANDROMEDA BUXIFOLIA (box-leaved Andromeda). Bot. Mag. t. 2660. *Racemes pointing one way, and naked; corollas subcylindrical; leaves cordate, ovate, quite entire, with a little dagger point.*—A most elegant plant, native of the island of Bourbon; grows on mountains, and was first discovered by Commerson. With us it flowers from April to July, growing from one to three feet high; the leaves are of a strong evergreen texture, and the flowers exceedingly beautiful. It is preserved without difficulty in the greenhouse, and may be raised from seeds, which are perfected in this country. The soil should be sandy peat.

6. ANDROMEDA JAMAICENSIS (Jamaica Andromeda). *Peduncles aggregate; corolla ovate, transparent; leaves alternate, broad, lanceolate, obtuse, entire, cinerous beneath.*—An ornamental species; native of Jamaica. Introduced 1793.

It is generally treated as a stove plant, but probably would do better in a green-house. It requires to be planted in peat mould; and young cuttings strike best under a bell-glass in sand.

7. *ANDROMEDA MARIANA* (Maryland Andromeda). Pl. m. 6. 448. f. 6. *Peduncles aggregate on the branches; corolla cylindrical; leaves oblong, ovate, entire, deciduous.*—In this species the corolla is rather cylindric-bell-shaped; anthers without awns. A native of North America. Introduced in 1736, by P. Collinson; of this there are two varieties, *α ovals*, with oval leaves; *β oblonga*, with oblong leaves.

The corollas are shaped like those of the *arbutus*, and are of an herbaceous colour. They appear in June and July, and are sometimes succeeded by fruit, which seldom ripens in England.

8. *ANDROMEDA SPECIOSA* (large-flowered Andromeda). Bot. Mag. 970. *Peduncles aggregate; corolla globose, campanulate; leaves oval, sub-serrate, shining.*—There are three varieties of this species, viz. *α A. nitida* (smooth-leaved Andromeda).

This is a smaller and less robust shrub than variety *γ*; the leaves are not so bluntly crenated, but rather serrate, and quite entire at the base; flowers less, and not so many in a bunch. Native of North Carolina. Flowers in June.

β glauca (glaucous-leaved Andromeda). Bot. Reg. t. 1010. An evergreen shrub, covered all over with a blue bloom. *Leaves serrated, oval-lanceolate, acute, the upper being narrow, and often entire.* The flowers proceed from the old wood in axillary fascicles, and are white and cernuous. *Pedicels smooth. Calyx short, bluntly five-parted. Corolla campanulate, deeply five-parted, with the segments narrower at the base, and acute at the apex.*

γ Pulverulenta (mealy-leaved Andromeda). Bot. Mag. t. 1095. A very handsome bushy shrub. *Leaves alternate, oval, slightly notched, the under surface of a bluish white, resembling the bloom of plums, and, like that, rubbing off when roughly touched. Flowers in bunches, nodding, white, much like those of the lily of the valley, sweet scented.* May be increased by layers or raised from seeds.

9. *ANDROMEDA CORIACEA* (thick-leaved Andromeda). Bot. Mag. t. 1095. *Ra-*

comes axillary, simple; leaves ovate, entire, shining; branchlets three-cornered.—This species of Andromeda constitutes an interesting ornament amongst the lesser American shrubs, and from its flowers being produced at a somewhat later period, is advantageously mixed with the *Sedums*, *Kalmias*, *Azaleas*, &c. It retains its foliage during Winter, and blossoms about Midsommer, yielding flowers that are more showy than most others of the genus.

Though it bears the temperature of our variable seasons tolerably well, and flowers freely, still the dead terminations of its peduncles or flower-stalks (which are not unusual) are sure proofs of its being in an uncongenial climate. Introduced 1765.

It may be propagated by layers, put down at the end of June; observing that the young shoots only will strike root.

10. *ANDROMEDA ACUMINATA* (acute-leaved Andromeda). Ex. Bot. 2, t. 89. *Racemes axillary, simple; leaves ovate, lanceolate, acuminate, serrate.*—This is an elegant North American shrub, hardy enough in our climate, growing well in bog earth, but not always flowering. The stems are two or three feet high; branches round, smooth, mostly zigzag; leaves alternate, on short stalks, evergreen, very smooth, and shining; their substance finely reticulated with veins: flowers smell like honey, are numerous, white, drooping; in simple, short, axillary, bracteated clusters. The fading corolla turns to a dusky hue, the branches are hollow, but interspersed by frequent transverse membranous partitions, a structure observable in the pith of many other plants. Introduced 1765.

11. *ANDROMEDA CATESBÆI* (Catesby's Andromeda). Bot. Mag. t. 1955. *Racemes terminal and axillary, one-sided; corolla ventricose, tubular; leaves oblong, lanceolate, finely serrated.*—This is an ornamental evergreen shrub, quite hardy in this country. It is a native of Virginia, Carolina, and Georgia. Introduced in 1794. Flowers in June and July.

It flourishes, planted in a border composed of peat earth and fresh loam in equal proportions; and may be increased by layers, or by seeds, which are frequently perfected here.

12. *ANDROMEDA RACEMOSA* (branching

Andromeda). *Racemes terminal, simple, bracted; corolla cylindrical; leaves oblong-lanceolate, serrated.*—It differs from the *paniculata* in the racemes being less paniced, in having a linear, lanceolate, stiff, green, deciduous bracte under each flower, longer than it; in the capsules retaining the style, and in the leaves being more serrate. This was found in Pennsylvania by Kalm. Introduced here in 1736 by P. Collinson. Flowers in July.

13. *ANDROMEDA FLORIBUNDA* (many-flowered Andromeda). Bot. Mag. t. 1566. *Quite smooth; leaves oblong, ovate, acute, finely serrulate; racemes axillary and terminal, clustered.*—In its native country it grows to a large and very handsome shrub, and is covered with a profusion of flowers early in the Spring. The conical five-cornered flowers easily distinguish it from every other known species of Andromeda. Blossoms in April; but the flowers are formed in the Autumn, and remain unexpanded through the Winter. Native of the mountains of Georgia, in boggy places. Introduced in 1811. Propagated by cuttings, requires the protection of a green-house, and in Summer to be frequently watered.

14. *ANDROMEDA SPICATA* (spiked Andromeda). Wats. d. b. t. 26. *Spikes terminal, one-sided; leaves membranous, smooth, oval, lanceolate, serrulate, acute.* An ornamental shrub, two feet high. Native of North America.

5. *ANDROMEDA ARBOREA* (sorrel-tree Andromeda). Bot. Mag. t. 905. *Panicles terminal; corolla pubescent; leaves elliptical, acuminate, toothletted.*—This is a native of North America, growing along the margins of streams, and in swamps, from Pennsylvania to Florida. In the valleys of the Alleghany mountains it attains the height of fifty or sixty feet, but in the middle country, according to Elliott, seldom exceeds twenty. It is a beautiful tree, and from the agreeable taste of the leaves, is known by the name of sorrel tree. The flowers grow in long naked spikes from the sides of the branches; they are of an herbaceous colour, and ranged on one side of the stalk.

In England it is tolerably hardy when once established, but tender while young. It should be planted in a border, composed of half peat earth and half loam, and can only be increased by

seeds, which must be obtained from its native country. Cultivated here in 1752.

16. *ANDROMEDA AXILLARIS* (axil-flowering Andromeda). Duham. t. 39. *Racemes axillary, simple; corolla oblong; leaves ovate, acute, serrulate.*—A native of Carolina, where it was found by Mr. John Cree. It was introduced in 1765, and flowers from May to August.

β *Longifolia* (long or fine notched-leaved Andromeda). Bot. Mag. t. 2357. *A. Axillaris* and *Catesbæi* have been often considered as varieties of the same species, and as both vary considerably in the form of the leaves, they may sometimes approach so near as to render it not easy to decide to which species some individuals belong, or at least not from the foliage alone; but *A. axillaris* in all its varieties may be generally distinguished by its shorter, more erect, and more clustered racemes. In *A. catesbæi*, the racemes are longer, more or less cernuous, and are furnished with longer and more pointed bractes.

Culture. Most of the species are hardy, deciduous shrubs, which delight in moist ground. Sweet says they thrive best in peat soil, or in sandy loam; they may be increased by their creeping roots, which put up suckers at a distance, that may be taken off with roots, and transplanted where they are to remain. Those that are imported from America may be propagated by seed sown in the Spring, in a bed of moist earth. The seeds must be very thinly covered, as they are small, and would rot if covered deep. When about an inch high they should be planted out thinly in other pots, where they will grow strong, and when large enough may be planted in the open ground. Spring is the best time to plant them out; they may also be increased by layers in Autumn.

ANDROPOGON (a hyperbolic comparison of the little tuft of hairs upon the flower to the beard of a man).

Class 23. 1. Polygamia Monœcia. Nat. Ord.

The Characters are—*HERMAPHRODITE calyx, one-flowered; pale glume, bearded either at base or tip; stamens, 3; styles, 2; seed, 1; MALE ovary, 0.*

1. *ANDROPOGON ALOPECUROIDES* (fox-tail Andropogon). Sloan. hist. 1, t. 14. *Panicle loose, rachis woolly, a twisted awn to each floscule.*—The down longer than the flowers, even in the very

glume. Native of Jamaica and Virginia. Introduced 1818.

2. *ANDROPOGON SACCHAROIDES* (sugar cane-like Andropogon). *Branches of the panicle simple; florets in pairs; hermaphrodite awned sessile, the other awnless pedicelled, withering; pedicel and rachis woolly.*—Native of Jamaica. Introduced 1818.

3. *ANDROPOGON HIRTUS* (hairy Andropogon). Host. gram. t. 1. *Spikes of the panicle conjugate; calyces shaggy.*—Native of the South of Europe. Introduced 1802.

4. *ANDROPOGON SERRATUM* (saw-leaved Andropogon). *Thumb. jap. 41. Panicle loose; one floscule sessile, villose at the base; the other pedicelled, with the pedicel villose, and shorter than the calyx.*—Native of Japan. Introduced 1816.

5. *ANDROPOGON ISCHÆMUM* (woolly Andropogon). Sch. gram. 2, t. 33. *Spikes digitate, about 8; florets twin, woolly at base; hermaphrodite sessile, bearded; male stalked, bearded.*—Native of the South of Europe. Introduced 1768.

Culture. Few of these grasses have been cultivated in European gardens; as they are for the most part natives of the East or West Indies, they would require the protection of a stove.

ANDROSACE.

Class 5. 1. Pentandria Monogynia.

Nat. Ord. *Primulaceæ*.

The Characters are,—*Capsule 1-celled; Corolla hypocrateriform, contracted at the orifice; Stigma globose.*

1. *ANDROSACE MAXIMA* (oval leaved Androsace). Jac. aus. 4. t. 331. *All villous; Leaves ovate oblong, and sepals toothed; Involucres very large; Flowers very small.*—The flowers of this species appear in April or the beginning of May; the seeds ripen in June, and the plants soon after perish. It grows naturally among corn, in Austria, Bohemia, and other parts of Germany, in the Valais, Piedmont, Carniola and Hungary; and was cultivated here, in 1596, by Gerard.

2. *ANDROSACE ELONGATA* (cluster-flowered Androsace). Jac. aus. 4. t. 330. *Much branched, rough; Branches spreading; Leaves oblong, somewhat toothed; Sepals lanceolate entire; Flowers very small.*—Native of Austria, near Vienna, even in the suburbs; flowers in

April, and perfects its seeds in June; introduced in 1776, by M. Thouin.

3. *ANDROSACE SEPTENTRIONALIS* (tooth-leaved Androsace). Bot. Mag. 2021. *Roughish erect, Leaves lanceolate, toothed attenuate at base. Prop. ped. elongated upright. Corolla longer than calyx. Petals ovate entire.*—It is a hardy annual, the flowers of which make very little show from their minuteness, they are produced in May and June. It is nevertheless a pretty plant, that looks very well upon rock work. Is easily propagated by seeds, which it ripens freely.

Native of Lapland, Sweden, Denmark, Switzerland, Germany, Russia, in mountainous situations; cultivated by Mr. Miller, in 1755.

4. *ANDROSACE VILLOSA* (villous Androsace). Bot. Mag. 743. *Leaves lanceolate entire, villous, Umbel few-flowered, Corolla longer than the ovate campanulate calyx.*—It is very nearly allied to *A. Chamæjasme* from which it is distinguished by the glaucous colour of the leaves, and the involucre consisting of only 2 or 3 leaflets. Common in the Swiss Alps, Jura, &c. in the mountains of Austria and Carniola, in the Pyrenees, &c. Introduced 1768, by Professor de Saussure. Propagated by parting the roots. During the summer it should be kept entirely in the shade.

5. *ANDROSACE LACTIFLORA* (Buckthorn-leaved Androsace). Bot. Mag. 2022. *Smooth; leaves lanceolate linear, toothed at end; Peduncles spreading elongated, Corolla longer than calyx; petals obcordate.* (*A. coronopifolia*, B. M.) It is very nearly allied to *A. septentrionalis*, but on bringing them together some remarkable differences will be perceived, particularly in the greater laxity of the foot-stalks of the flower, and in the size and form of the corolla. It flowers in July, six weeks later than the other. Native of Siberia. Introduced 1806.

6. *ANDROSACE CHAMÆJASME* (Grass-leaved Androsace). Bot. cab. 232. *Pubescent; leaves lanceolate, nearly entirely ciliated; Umbel few-flowered; Corolla longer than the turb. calyx.*—The *Chamæjasme* has a constant habit of running at the root, by which it is readily increased, and being very hardy is easily cultivated. It is a native of the Austrian Alps, and forms a beautiful

little rock plant. It may be kept in small pots in light loam, without any covering, and in Summer exposed to the full sun: they flower in the Spring, and frequently a second time in Autumn. Introduced 1768.

7. *ANDROSACE LACTEA* (white flowered Androsace). Bot. Mag. t. 868. *Cauliscent, smooth; Leaves linear, shining, entire, ciliated at end; Umbel few-flowered; stalks elongated; Corolla longer than turbinated calyx.*—The leaves of this species are perfectly smooth even at the edges; the peduncles equal the scape in length, usually four; the number of the leaflets of the involucre is the same as that of the peduncles; the flowers are milk white with a yellow eye in the centre and heart-shaped petals. Native of the Alps of Switzerland, Austria, Carniola, and Dauphiny, and therefore sufficiently hardy to bear our winters. Flowers from June to August. Introduced 1752.

8. *ANDROSACE CARNEA* (raw-leaved Androsace). Bot. cab. 40. *Cauliscent pubescent; Leaves scattered linear, subulate ciliated; Umbel few-flowered; Stalks short; Corolla longer than turbinated calyx.*—This beautiful little plant is from Switzerland; and although introduced so long since as 1768, it has never been plentiful in this country. Its delicate flowers are produced in April, and last for a considerable time before they fade. The whole plant is represented in our figure, and of a size which it rarely exceeds, being one of those minute and delicate gems, which render the higher Alps so very interesting. It is rather difficult to increase, except by seeds, is perfectly hardy, and seems to grow pretty well in a small pot in light sandy loam.

9. *ANDROSACE OBTUSIFOLIA* (Blunt-leaved Androsace). All. ped. l. t. 46. f. 1. *Leaves elliptical lanceolate smooth; Scapes umbellate.*—It is found on the high mountains of Switzerland, Italy and Syria. Introduced 1820.

10. *ANDROSACE NANA* (dwarf Androsace). *Leaves ovate lanceolate, from middle to end acutely toothed; Scape leaves and stalks rather longer than involucre, Corolla shorter.*—An ornamental annual, flowering in April and May. Native of Denmark. Introduced 1803.

11. *ANDROSACE FILIFORMIS* (filiform Androsace). *Leaves ovate-toothed, pe-*

toiled; rays of the Umbel capillary; corollas white, exceeding the bell shaped calyx.—Native of Siberia. Introduced 1803.

12. *ANDROSACE ALBA* (capitate Androsace). Linn. trans. 11, t. 33. *Leaves spatulate, cut; Umbel capitate, Corolla hypoc: ateriform.*—Perennial. Native of Caucasus. Flowers in June. Introduced 1827.

The species of this Genus are elegant mountaineers which thrive best in small pots, in a mixture of turfy loam and peat; the pots must be well drained with potsherds, as, if they are allowed to get too wet, it will injure them very much; they are increased by seeds or dividing at the root.

ANDROSEUM (from *aner*, andros, a man, and *aima*, blood; the fresh capsules crushed between the fingers bring out a blood coloured juice.

Class 16.7. Monadelphia Polyandria. Nat. Ord. *Hypericæ*.

The Characters are,—*Calyx deeply 5-cleft inferior; Petals 5; Filaments numerous united at base into 3 sets; Capsule with many seeds.*

ANDROSEUM OFFICINALE (common Tutsan). Eng. Bot. t. 1225. *Styles 3; Capsule pulpy; Stem shrubby, compressed.*—This species is easily known by its shrubby stem, large yellow flowers, and purplish black fruit. The leaves when bruised have an aromatic scent. The stem is woody, perennial, and quadrangular; the leaves are rather heart-shaped, veiny, and as well as every other part of the plant smooth. They were formerly applied to fresh wounds, and hence the French name it bears *La toute saine*, and the English *Tutsan*. It is very rare in any other counties except Norfolk, where it is found growing plentifully in shady lanes, thickets and woods, flowers in July and fruits in Autumn.

It is easily increased by dividing the plants at the root early in spring, or by seeds. They will grow well under shrubs or trees.

ANDRYALA.

Class 19.1. Syngenesia Polygamia Æqualis.

Nat. Ord. *Compositæ*.

The Characters are—*Receptacle nitous; Involucre many parted nearly equal, rounded; Pappus simple, sessile.*

1. *ANDRYALA CHEIRANTHIFOLIA* (various leaved Andryala). L'Herit. st.

25. t. 18. *Leaves glandular downy; lower runciantes toothed; upper ovate lanceolate, entire; Stem and peduncles glandular.*—Perennial. It is three feet high, and full of milk. The flowers are yellow, scarcely nodding. Native of the Island of Madeira. Introduced 1777.

2. *ANDRYALA PINNATIFIDA* (wing-leaved Andryala). *Leaves downy pinnatifid; Involucrum downy pilose; Hairs rigid.*—There are two varieties of this species. α A native of Madeira, β of the Canary islands. Found there by Mr. Francis Masson. It flowers in July and August. Introduced 1778.

3. *ANDRYALA CRITHMIFOLIA* (Samphire-leaved Andryala). *Leaves pinnated linear downy.*—Native of Madeira. Found by Mr. Francis Masson. Introduced 1778.

Both of these species are biennials.

4. *ANDRYALA NIGRICANS* (dark flowered Andryala). *Leaves pinnatifid lyrate; Flowers corymbose aggregate; Peduncles and involucrum hispid.*—Native of Barbary. Flowers from June to August. Introduced 1804.

5. *ANDRYALA RAGUSINA* (downy Andryala). *Mil. ic l. t. 146. f. 1. Leaves downy oblong; lower toothed; stem branched; Branches 1-flowered.*—Lower leaves about four inches long, little more than half an inch broad, very hoary. Stems weak, nine inches high, dividing towards the top into two or three smaller branches, and at each joint a small leaf almost entire; one yellow flower terminates every branch in June and July. This plant being very hoary makes a pretty appearance, intermixed with others whose leaves are green. It will not live abroad, except in a dry soil and warm situation. Native of the Archipelago. Introduced 1753. Flowers from June to August.

6. *ANDRYALA LANATA* (woolly Andryala). *Mil. ic l. t. 1. 46. f. 1. Leaves ovate woolly; lower somewhat toothed; Corymb terminal; Peduncles about 1-flowered.*—Root thick, fibrous. Leaves broader, longer, and more downy. Flower-stems near two feet high, with a single leaf at each joint, whence arise peduncles, each sustaining one large yellow flower. This is biennial, flowers in June, and the seeds ripen in August. (According to others it is perennial. The whole plant is white; receptacle generally not villose. Native of the south of Europe. Cultivated in 1732,

by James Sherard, M.D.

All these rather pretty plants are natives of the south of Europe and the north of Africa, they require the protection of a green-house, where they flower all the summer, till late in the Autumn, frequently perfecting their seeds, by which they may be propagated. The perennial sorts may also be increased by their creeping roots.

ANEILEMA; a genus resembling *Commelina* from which it is chiefly distinguished by not having its flowers enclosed in a spathe).

Class 3. I. Triandria Monogynia.

Nat. Ord. *Commelineæ*.

The Characters are—*Calyx* 3-leaved; *stamens* 6; *anthers* 3; *sometimes* 2-4 dissimilar; *involucrum* 0; *capsule* 2-3 celled; *seeds fixed to the valves*.

1. *ANEILEMA BIFLORUM* (creeping Aneilema). *Smooth; stem creeping; leaves lanceolate; flowered stalks 2-flowered.*—A native of New Holland; flowers in June or July. Introduced 1820.

2. *ANEILEMA SINICUM* (Chinese Aneilema). *Bot. reg. 669. Stem branched diffuse; leaves ligulate acuminate; racemes alternate about 7 placed in a panicle form; stamens bearded 3 naked.*—This species is not more than nine or ten inches high, has broadish ligulate leaves, and 1 of the 3 bearded stamens is with only the imperfect rudiment of one. It is a native of China, flowering in May and June. Introduced 1820.

3. *ANEILEMA LONGIFOLIA* (long leaved Aneilema). *Hook. ex. flor. t. 204. Leaves linear lanceolate, acuminate ciliated at the base; panicle terminal lax, the lower branches bracteated, crowded.*—It is a native of stagnant waters in Zanzibar. The flowers drooping before expansion are of a pale purple colour, they are produced in May and June. Introduced 1823.

This genus thrives in loam and peat, and may be propagated by ripened cuttings placed under a hand glass in moist heat.

ANEMONE (from *Anemos*, wind; because the greater part of the species grow in elevated places, much exposed to the wind).

Class, Polyandria Monogynia.

Nat. Ord. *Ranunculaceæ*.

The Characters are—*Involucrum* 3-leaved distant from the flower cut; *Sepals* 5-15 petaloid; *Petals* 0.

1. *ANEMONE CAPENSIS* (Cape Ane-

money). Bot. Mag. t. 716. *Leaves biter-nate, rigid; smooth, segments cuneiform toothed at end.*—The *scape* is rigid hispid and branched, each branch bearing one terminal flower. Involucre an ovate leafy stipule. *Calyx* or external series of petals constantly six, broader than the internal, hairy underneath, flesh-coloured. *Petals* or internal series about fourteen, white or slightly tinged with flesh colour. *Leaves* twice ternate; *leaflets* wedge-shaped, trifid, middle one elongated; *segments* generally 3-toothed. Flowers in March. Is propagated by seeds only. Requires the protection of a green-house. Native of the Cape, in stony places on the declivities of mountains. Introduced 1795.

2. ANEMONE CORONARIA (poppy Anemone). Bot. Mag. 841. *Leaves ternate with multifid segments, and linear mucronate lobes, sepals 6 oval close.*—The ancient fabulists ascribe to this flower a very high birth. They tell us that Venus in her grief for the death of Adonis mingled her tears with her blood, and thence sprung the first Anemone.

The poppy anemone is well calculated for the general flower garden, is easy of cultivation, without expense; and being increased from seeds, which yield flowers of innumerable varieties of tint, pleasures are constantly excited by the anticipation of new and superior beauties; such as may well induce the poet to exclaim

See! yon anemones their leaves unfold,
With rubies flaming, and with living gold.

It has been the delight of florists ever since the time of Gerard, and its numerous varieties, displaying every beauty and splendour of colour, are among the most rare and admired decorations of a parterre. The *leaves* vary in breadth. The natural colour of the *flower* which is cup-shaped, and full two inches broad, is a light purplish blue; the *seeds* are covered with long, soft, tenacious down, concerning the effect of which an amusing story is told by Tournefort. A Lawyer in the south of France stole these seeds from a covetous amateur, by ordering his page to drop, as if by accident, the silk train of his robe, when they passed over the bed of seeding Anemones, and thus obtained a plentiful supply.

The varieties of this species are very common and graceful ornaments in gar-

dens. Modern florists reckon more than two hundred varieties of this flower, but they are not named, as in the case of tulips and pinks. *A double Anemone, in order to be a fine one*, should have a strong upright stem, about nine inches high; the flower two to three inches in diameter, the outer petals firm and horizontal, except a little turning up at the end; while the smaller petals within these should lie gracefully over each other so as to form an elegant whole. The plain colours ought to be brilliant and striking, the variegated tints clear and distinct.

3. ANEMONE PAVONINA (Peacock Anemone). *Leaves 3 parted; lobes cuneated, deeply toothed; leaves of the involucre sessile, the leaves oblong; sepals 10-12, lanceolate, very acute.*—This species of Anemone is rarely seen with single flowers, but the double variety is found common enough in gardens under the name of *A. Œil de Peau*. The flowers are variable in colour. It is easily distinguished from *A. coronaria* by its very acute sepals, flowers in April and May.

4. ANEMONE HORTENSIS (star Anemone). Bot. Mag. 122. *Leaves 3-parted with cuneate cut toothed lobes, involucre sessile oblong or cut, sepals 10-12 oblong.*—We are more and more convinced, that in our eagerness for novelties we daily lose plants by far more ornamental than the new ones we introduce; the present, a most charming spring plant, with which the gardens abounded in the time of Parkinson, is now a great rarity; its blossoms, which are uncommonly brilliant, come forth in April, and appear to their greatest advantage only when the sun shines. Native of Italy, &c. Introduced 1597.

It may be propagated by seeds, or by parting its roots in Autumn, in the former way we may obtain beautiful varieties.

It prefers a light loamy soil, and moderately exposed situation.

Roots of a variety of this plant with scarlet double flowers are imported from Holland, under the name of Anemonoides, and sold at a high price.

5. ANEMONE PALMATA (palmated Anemone). Bot. Reg. 200. *Leaves cordate, roundish, bluntly 3-5 lobed toothed, Involucre sessile trifid, sepals 10-12 oblong.*—This handsome species of Anemone was not generally known

to our old English botanists, though Gerard mentions one that has been considered synonymous. Its identity however, is not sufficiently clear. In reference to it, Gerard says, "but my selfe can giue you no certaine knowledge of the plant because I did never see it."

He says also respecting its virtues "the leaves stamped, and the iuce sniffed up into the nose, purgeth the head mightily."

When the roots are required to be parted, it should be done in the Autumn. A light loamy soil produces luxuriant plants. Native of rather moist waste ground, in Portugal, Spain, South of France, &c., flowering early in spring.

β lutea.

This fine variety is a native of Portugal and Algiers. It is perennial, but not very hardy, therefore should have a little protection in severe weather.

It flowers in May or June, and may be increased slowly by separating the roots. The soil should be light and sandy.

6. *ANEMONE DECAPETALA* (little three-leaved Anemone). *Leaves ternate; leaflets rounded, unequally three lobed and toothed; petals 10-12 elliptic lanceolate.*—The root of this curious little plant, is ovate and tuberous, about the size of a filbert. The petals white, silky, and purplish at the back. The stalk two or three inches high. Flowers in May. Native of Peru.

7. *ANEMONE PARVIFLORA* (small flowered American Anemone). *Leaves ternate; leaflets wedge-shaped, abrupt and crenate at the extremity; Involucral leaves sessile, deeply 3 cleft, notched.*—Native of North America at the mouth of the rivers and rivulets falling into Hudson's Bay; from the rocky mountains to the Arctic sea, in limestone tracts and barren grounds; Labrador, and Newfoundland; flowering in April and May. Introduced 1824.

8. *ANEMONE CAROLINIANA* (little Carolina Anemone). *Leaves ternate; leaflets deeply 3-cleft cut, sharply toothed; involucral leaves 3 cleft notched.*—A very slender and delicate plant nine inches high; flower on a long pedicle, sepals purplish. Native of the banks of the Missouri, flowering in May. Introduced 1824.

9. *ANEMONE APENNINA* (blue mountain Anemone). Eng. Bot. 1662. *Leaves*

3-ternate with a branched stalk, sepals 12-14 oblong obtuse; leaves of involucre stalked.—The root is perennial and tuberous. Flower upright, of a pale blue colour, and sweet smell. It flowers in April, at the same time as the wood anemone, with which it has some affinity in its foliage, but the root is much thicker and more knobby, the petals much narrower, more than twice as many, and of a light pleasant purplish blue; when they first expand the outside has a rich purplish tint, which is lost when the flowers have been sometime exposed to the sun.

Native of England, in Wimbledon Park, and also of the Apennines, Italy, Caucasus, &c.

It is a very ornamental plant, (six inches high), suitable to the flower garden or plantation; and loves a light, loamy soil.

10. *ANEMONE CÆRULEA* (blue Anemone). *Leaves of the involucre 3-5 cleft on short stalks, with deeply toothed segments.*—The stem is six inches high 1-2 flowered; the flowers blue or white. Native of Siberia, flowering May and June. Introduced 1766.

11. *ANEMONE URALENSIS* (ural Anemone). *Involucre leaves on short stalks thrice cut with linear cut toothed segments, sepals 5-6 oblong.*—Native of the Ural mountains, The flowers tinged with blue, and produced in May. Introduced 1824.

12. *ANEMONE BALDENSIS* (strawberry like Anemone). Jac. ic 1. t. 103. *Leaves biternate with a branched stalk, segments many parted with linear lobes, involucre shortly stalked, multifid; sepals oblong.*—Native of Switzerland, flowers in May. Introduced 1792.

13. *ANEMONE NEMOROSA* (wood Anemone). Eng. Bot. 355. *Leaves ternate with trifid cut toothed lanceolate acute segments; involucre stalked similar, sepals 6 elliptical.*—The single wood Anemone is indigenous to most part of Europe and North America, in groves, hedges, hills, bushy, and shady places, &c.; but the double variety is the nursing of the florist. In almost every shrubbery, and in many gardens, this plant is particularly desirable. Under trees and shrubs, in shady corners, where but few plants will grow, this attains its greatest luxuriance. It spreads over a wide space, and being well established, its foliage in spring forms an even

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carpet of verdure for the earth, which is spotted with its delicate flowers, as the blue firmament is studded with shining stars.

The wood Anemone is found occasionally with numerous small spots on the under surface of its leaves, and sometimes though less frequently on its petals also. Erroneous conclusions were formerly drawn from these marks. It was believed they were the sori, or parts of fructification, of a fern; and the plant was classed accordingly. These spots are now known to be a species of fungus; are among the thousands of epiphyllous fungi, or parasitic vegetables, which are produced on the surface of leaves; and which have opened a new field of inquiry to the botanist, as inexhaustible as it is wonderful.

In fine clear weather the blossoms are expanded and face the sun; but in the evening and wet weather they are closed and hang down. This plant is acrid and in some degree poisonous. Goats and sheep eat it; but horses, cows, and swine refuse it. It is now disused in medicine; formerly the leaves and flowers bruised were used, (prepared as a blister) to remove intermittent fevers. This plant is sometimes called the *wind flower*.

14. *ANEMONE LANCEIFOLIA* (lance-leaved Anemone). *Leaves all stalked, ternate; segments lanceolate, crenate toothed; sepals 5, ovate acute.* It differs from *A. trifolia* in the leaflets being lanceolate not ovate-lanceolate, and crenate toothed, not truly toothed, with the flowers a little larger. Native of Pennsylvania and Virginia on high mountains in a boggy soil. Introduced 1823.

15. *ANEMONE TRIFOLIA* (three-leaved Anemone). *Mor. s. 4. t. 25. f. 1. Leaves all stalked, ternate with ovate lanceolate acute toothed segments, sepals 5 elliptical obtuse.*—Native of France, Carniola, and Siberia, growing in woods and flowering at the end of April. Introduced 1597.

16. *ANEMONE RANUNCULOIDES* (yellow wood Anemone). *Eng. Bot. 1484. Radical leaves 3-5 cut with subtrifid cut-toothed segments, involucre stalked, 3-parted toothed, sepals 5-6 elliptical.*—Frequent in groves, thickets, and hilly pastures, throughout the North and middle of Europe, as well as Siberia and part of Caucasus, but rare in England.

The root is slender, horizontal. *Herbage* not unlike *A. nemorosa*, but the leaflets are more elongated and cut, and the stalks of the *involucre* much shorter. The *petals* are broader, and of a full yellow; the *partial stalk* appears to droop as the fruit ripens. The *germen* are nearly orbicular, compressed downy; the *style* of each forming a strong incurved beak. It flowers early in April and is perennial. A violet coloured variety is said to be found on the Pyrenees.

17. *ANEMONE REFLEXA* (reflex flowered Anemone). *Leaves ternate, leaflets somewhat 3-cleft; toothed at the extremity; petals 5 or 6, linear obtus, reflexed.* Native of Siberia, and very much resembling *A. ranunculoides*. Introduced 1824.

18. *ANEMONE SYLVESTRIS* (snow-drop Anemone). *Bot. Mag. 54. Leaves ternate roquinate, segments cut-toothed at end, involucre stalked similar, sepals 6 elliptical.*—This is a native of Germany, and has been long cultivated in this country. It is a perennial plant, growing about a foot high, and producing its large white flowers in May.

It increases itself freely by the roots, and will thrive in almost any situation, in light loamy soil, either in pot or out. Introduced 1596.

19. *ANEMONE ALBA* (white Anemone). *Bot. Mag. 2167. Leaves ternate or quinate, segments cut-toothed at the end; involucre stalked similar; sepals 5 obovate.*—The flower is at first white, but turns purplish with age; has only 5-round conical petals, which if the number of the petals are constant, would at once separate it from *A. sylvestris* of which Jussieu suspects it may be only a variety. It is a hardy perennial, flowering in April. Native of the steppes of Daudria. Introduced 1820.

20. *ANEMONE VIRGINIANA* (Virginian Anemone). *Herm. par. t. 18. Leaves ternate with trifid acuminate cut-toothed segments, involucre stalked similar; sepals 5 elliptical.*—The flowers are small, and of a greenish yellow colour. The whole *herb* is downy and soft to the touch; the *seeds* very woolly, in an oval head, on a cylindrical receptacle. Native of North America, in woods, on the side of dry sandy hills from Canada to Carolina, flowers in May and June. Introduced 1722.

21. *ANEMONE PENNSYLVANICA* (Penn-

sylvanica Anemone). *Leaves 3-parted with cut-toothed acuminate lobes; involucre sessile similar; sepals 5 elliptical; fruit hairy.*—This is a tall, caulescent species, whose *flower-stalk* is angular, a foot and a half or two feet high, twice forked and variously compound. The seeds are compressed, pointed, and sparingly downy. Native of North America, in meadows, and on the borders of woods, from Canada to Pennsylvania, flowering in June and July. The flowers are large and white, with yellow anthers. Introduced 1766.

22. ANEMONE DICHOTOMA (forked Anemone). Lin. fil. d. 2. t. 15. *Leaves 3-parted with cut-toothed oblong lobes, involucre ones sessile similar; sepals 5 elliptical; fruit smooth.*—It is frequent throughout Siberia, also in wet woods, and natural meadows of Canada, and the western parts of New York, flowering in May and June. The flowers are white, small, and tinged with red on the outside. Dr. Hooker considers this and the *pennsylvanica* identical. Introduced 1768.

23. ANEMONE UMBELLATA (Umbel flowered Anemone). *Radical leaves 3-5 parted; segments trifid, very entire, densely villous at their margins; those of the involucre undivided.*—Native of Cappadocia. Introduced 1824.

24. ANEMONE NARCISSIFLORA (narcissus flowered Anemone). Bot. Mag. 1120. *Radical leaves slightly hairy, in 3 or 5, very deep, wedge-shaped segments, with many unequal, linear lanceolate lobes.*—The umbel of pure white flowers, with obovate petals, occasionally tinged, especially underneath, with purple, readily distinguishes this species. It flowers early in summer, and is of an elegant appearance, though seldom seen in gardens. It is found in mountainous pastures, especially on a calcerous soil, almost throughout the northern hemisphere; in the Pyrenees and all the Alpine countries, in Siberia, Caucasus, Cappadocia, as well as in Canada, and on the North-west coast of America; but not in Britain, Greece, nor the Archipelago. Introduced 1773.

25. ANEMONE SIBERICA (Siberian Anemone). *Leaves terminate with cut-toothed ciliated segments. Involucre on short stalks, 3 cut; sepals 6 round.*—A native of Siberia, beyond the Baikal, flowering in June, Introduced 1804.

CULTURE OF ANEMONES.

The garden anemones are natives of the east, from whence their roots were originally brought; but culture has so improved them, that they are now become the chief ornaments to our gardens in the Spring. To prepare the soil for these plants, take a quantity of fresh, light, sandy loam, or hazel-earth, from a common or dry pasture, not dug above ten inches deep; mix this with a third part its quantity of rotten cow-dung, and lay it up in a heap; turn this over at least once a month, for eight or ten months, and every time pick out the stones and break the clods. After this mixture has been twelve months made, it will be fit for use.

The beds of this earth must be prepared in September, and should be made six or eight inches deep, in a wet soil; but in a dry one three inches will be sufficient: lay this compost at least two feet and a half thick, with about four or five inches of rotten neat's dung, or the rotten dung of an old melon or cucumber bed at the bottom; in a wet soil let the beds be rounded, so that the water may run off; but in a dry soil let them be nearer to a level: three weeks after the compost has been laid in, stir it about six inches deep with a spade, and then with a stick draw lines each way of the bed, at six inches distance, so that the whole may be in squares: then make a hole three inches deep in the centre of each square, and plant a root in each; and when all are planted, rake the earth of the whole bed smooth, so as to cover the roots two inches thick. The season of planting these roots for forward flowers is the latter end of September, and for those of a middle season is October: this is best done at a time when there are gentle rains. Some roots should also be saved to be planted after Christmas, for fear of accidents to the former from very hard weather. These usually flower three weeks after those planted in Autumn.

In the beginning of April the early planted roots will begin to flower, and they will keep in flower near a month, if the weather prove favourable, and they are properly shaded with mats, laid over hoops in the greatest heat of the day; the second, and last planted ones, will follow these; and, in the whole, there will be at least two months fine flowering.

Toward the beginning of June the first planted roots will lose all their leaves, and they must be then taken up and washed clean, and laid to dry on mats in the shade; after which they are to be put up in paper bags, and hung up to the time of planting them comes on again. The later planted ones are to be taken up also as soon as their leaves decay, and not suffered to remain to make new shoots, for then it is too late to remove them.

They are propagated two ways, either by dividing the roots or by sowing. The roots are to be divided as soon as they are taken up out of the ground: they will succeed if broken into as many parts as there are eyes or buds in them; but they flower most strongly, if not parted too small.

The way, by sowing, is this: choose first some good kinds of single anemones, called by the gardeners *poppy anemones*; plant these early, and they will produce ripe seeds three weeks after the flower first blows. This must be carefully gathered, and in August it should be sowed in pots or tubs, or a very well prepared bed of light earth, rubbing it between the hands with a little dry sand, to prevent several of the seeds from clinging together, and spreading them as even as possible all over the bed; after this a slight hair-brush should be drawn many times over the surface of the bed, to pull asunder any lumps of seed that may yet have fallen together; observing not to brush off the seed, and as much as possible not to brush it into heaps. When this is done, some light earth, about a quarter of an inch deep, should be sifted over the bed. If the weather be hot, the bed must be at times covered with mats laid hollow, and gently watered.

In about ten weeks after sowing, the plants will appear, if the season has been favourable, and they are to be carefully defended from the hard frosts by proper covering, and from the heat of the sun afterwards by a moveable reed-fence. As the Spring advances, if the weather be dry, they must be gently watered, and when their green leaves decay, there must be a quarter of an inch more earth sifted over them, and the like again at Michaelmas; and the bed must be kept clear from weeds, and the following Spring they will flower.

The single or poppy anemones will

flower most part of the Winter and Spring, when the seasons are favourable, and in a warm situation; and they require little culture, for it will be sufficient to take up the roots every other year, and when they are taken up, they should be planted again very early in the Autumn, or else they will not flower till the Spring. There are some fine blue colours among these single anemones, which, with the scarlet and reds, form a beautiful mixture of colours; and as these begin to flower in January or February, when the weather is cold, they will continue a long time in beauty, provided that the frost is not too severe. The seeds of these are ripe by the middle or end of May, and must be gathered daily as they ripen, otherwise they will soon be blown away by the winds.

The roots of *wood anemone* may be taken up when the leaves decay, and transplanted into wildernesses, where they will thrive, and in the Spring have a good effect in covering the ground with their leaves and flowers. The *blue anemone* flowers at the same time with the foregoing; and intermixed with it, makes a fine variety. Double flowers of both these sorts have been obtained from seeds. This, and most of the other wild anemones, may be propagated by offsets from the root, which they put out plentifully, and they will grow in most soils and situations. *Virginian anemone* and some others, produce plenty of seeds, and may be readily increased also that way.

ANETHUM.

Class 5. 2. Pentandria Digynia. Nat. Ord. *Umbellifera*.

The Characters are—*Involucre 0; petals involute, yellow; seeds compressed, with three ribs, intervals once banded.*

1. *ANETHUM GRAVEOLENS* (common Dill). *Fruit compressed.*—*Dill* differs from *Fennel* (which it otherwise resembles very much) in having an annual root, a smaller and lower stem; the leaves more glaucous, and of a less pleasant smell; the seeds broader, flatter, surrounded with a membranous rim, and of a less pleasant flavour; the umbels of flowers yellow, but smaller than those of fennel. This plant has a peculiar strong smell, but aromatic. The bruised herb is anodyne and resolvent. The seeds are aromatic, and contain an ethereal oil; are useful therefore in flatulencies; for this purpose they

rub the bellies of children with the oil prepared by infusion: the essential oil is also good in the colic. A distilled water, drawn off to the quantity of a gallon from a pound of the seeds, was ordered in the London Pharmacopœia; and occasionally made the basis of carminative draughts and julaps: its flavour is more agreeable than that of the seeds in substance. Along with the water arises a considerable quantity of essential oil, which is given from one to three or four drops, or more, as a carminative; and in hiccoughs. No mention is made of this in the last edition of the London Pharmacopœia. It grows wild among the corn in Spain and Portugal; also in Italy on the coast. It is annual, and was cultivated in 1597.

This plant is propagated by sowing the seeds, soon after they are ripe in Autumn, in a light soil, and where they are to remain, allowing them eight or ten inches to grow; when they appear, hoe them in the same manner as is practised for onions, carrots, &c., leaving the plants about eight or ten inches asunder every way, observing to keep them clear from weeds. When the seeds begin to form, cut up those that are intended to be put into the pickle for cucumbers, leaving those that are intended for seed until ripe; when you must cut, and spread them upon a cloth to dry, and then beat them out for use. If the seeds be suffered to fall upon the ground, the plants will rise the next Spring without any further care.

2. *ANETHUM SEGETUM* (Portugal Dill). Jacq. vind. t. 132. *Cauline leaves* 3; *fruit oval*.—The stem is six or seven inches high, round, smooth and even, streaked, and glaucous. *Branches* three or four, alternate, spreading, the length of the stem. *Leaves* three, bi or tripinnate, smooth and even, filiform, linear, flat; leaflets alternately subdivided; upper leaf triternate; leaflets very like the others, but undivided. *No involucre*, but only a rudiment. *Umbel* convex, spreading, dispersed. *Umbellules* nine, with the central floret abortive. *Corolla* flosculous, yellow; *petals* involute, length of the *stamens*; *styles* two, conical, permanent. *Fruits* oval, convex, with three raised streaks. Annual. Native of Portugal. Introduced 1796.

ANGELICA.

Class 5. 2. Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Seeds elliptic, oblong, curved, with three dorsal wings, and a narrow flat even border; calyx none; petals lanceolate, flattish, undivided, contracted at each end equal; flower receptacle, thin, wavy, narrow, permanent; flowers all perfect.*

1. *ANGELICA SYLVESTRIS* (wild Angelica). Eng. Bot. 1128. *Leaflets equal, ovate, lanceolate, serrate*.—Our *Wild Angelica* grows to the height of six feet, with a smooth stem. *Leaf-stalks* channelled on the upper surface, widening below into a large membranaceous sheath inclosing the stem. *Leaves* large and pinnate, as in the *Archangelica*; *pinnas* five and three-leaved; *pinnules* generally ovate, serrate, the serratures ending in a sharp, reddish point. *Peduncles* rising from the sheaths of the leaf-stalks. *Umbel* very large and close: universal involucre commonly none; but sometimes it has one or two very small, slender leaves. The *umbel* has as far as forty, and the umbellule eighty rays. *Involucres* permanent; leaflets 5-12, subulate, unequal. *Petals* nearly equal, white more or less tinged with purplish red. The fruit has four wings, and three ridges on each side.

It is perennial, and is found common in moist woods and hedges, and by the sides of rivers, flowering in July and August. It possesses in a far lower degree the same properties as garden Archangelia. The herb however dyes a good yellow.

2. *ANGELICA LUCIDA* (shining Angelica). Jac. vind. 3, t. 24. *Leaflets equal, ovate, cut serrate*.—The root is biennial; *stem* from a foot to two feet in height, round, hollow; *leaves* bipinnate, rising from a large striated sheath; *umbel* and *umbellules* convex and close; rays striated; *petals* of a dirty whitish or pale yellow colour; *seeds* brown, of a hot aromatic flavour, with little smell. It flowers in June, and the seeds ripen in August. Native of Canada. Introduced 1640.

3. *ANGELICA RAZOUKII* (decurrent-leaved Angelica). Gon. Ill. 13, t. 6. *Leaflets lanceolate, serrated, decumbent*. The root is perennial, thick, deeply fixed into rocks; *stem* three feet high, angular, with only three or four branches; the root and lower stem *leaves* triangular, almost a foot long; the upper surface of the leaves is

green and smooth, the lower ash-coloured and pubescent; *umbel* very large, hemispherical, consisting of about eighty unequal rays, from two to three inches in length, cinerous-pubescent; *corollas* before they unfold bright purple, afterwards white. Some of the umbels seem to be hermaphrodites, and others female. Native of the Apennines and Piedmontese mountains, flowering from June to August. Introduced 1816.

All the species of this genus like a strong loamy soil, and are readily increased by seeds. As they are tall growing plants that take a great deal of room, they are seldom cultivated.

ANGELONIA.

Class 14. 2. Didynamia Angiosperma.

Nat. Ord. *Scrophulariæ*.

The Characters are—*Calyx* deeply 5-cleft; *segments* 2, closer than the rest; *corolla* subbilabiate, distended; *stamens* 4, attached to the tube of the corolla; *filaments* unequal, shorter than the corolla; *slightly bowed and furred their whole length*.

ANGELONIA SALICARIÆFOLIA (Salichria leaved Angelonia). Bot. reg. t. 415. *Branches* 4 cornered, upright; *leafy only at their upper extremity, closely, and shortly furred; leaves* opposite, spreading, near, sessile, slightly indented at the edge, 2 inches long; *germen* spherical, pubescent; *capsule* spherical depressed, marked outside by 4 furrows, opening at the upper parts into 2 cells; *both valves splitting at the top into 2 parts; seeds* numerous wedge-shaped.—A very ornamental annual plant 15 to 18 inches high, dividing into branches immediately above the crown of the root. It grows naturally on the arid rocks of gneiss in the environs of Caraccas. It is known among the inhabitants by the appellation of *Angelon*, and used medicinally for the same purposes as the flowers of the violet with us. Flowers from August to October. Introduced 1818.

ANGOPHORA (from *angos*, a vessel, and *phoreo* to bear; form of fruit).

Class 12. 1. Icosandria Monogynia.

Nat. Ord. *Myrtaceæ*.

The Characters are—*Calyx* 5-fid, half above; *petals* 5; *Stamina* exserted; *stigma* simple; *capsule* 3-4 celled.

1. ANGOPHORA CORDIFOLIA (hispid Angophora). Bot. Mag. t. 1960. The

stem is covered with stiff hairs of a brownish red colour. *Leaves* opposite, cordate-ovate, nearly sessile, veined; *peduncle* long, hispid; *calyx* connate 8-10 ribbed; *segments* 4-5 linear. *Petals* 4-5 inserted into the border of the calyx, alternating with its segments; *stamens* very many, more than twice the length of the petals; *style* straight; *stigma* truncate. A tree, native of New South Wales; by no means tender, only requiring to be protected from frost. Propagated by cuttings. Introduced 1787.

2. ANGOPHORA LANCEOLATA (lanceolate-leaved Angophora). *Leaves* petiolate, lanceolate, acuminate, glabrous.—It varies with alternate and opposite leaves; is a shrub 4 to 6 feet in height, flowering from May to August. Native of New Holland. Introduced 1816.

The soil best suited for this species of the genus, is a mixture of loam, peat, and sand. Ripened cuttings take root in sand, under a hand-glass. They may be also raised from seeds, which are frequently produced in this country.

ANGRÆCUM (a latinized form of the Malay appellation *angrec* which is bestowed upon all epiphytous plants).

Class 20. 1. Gynandria Monandria.

Nat. Ord. *Orchidææ*.

The Characters are—*Sepals* conniving, galeate; *lip* spurred 3-lobed jointed with column; *pollen* masses 5; *stigma* concave, transverse.

1. ANGRÆCUM MACULATUM (spotted Angræcum). Bot. reg. t. 618. *Bulbs* dark green, slightly glaucous, shrouded at first by scales which wither away; *leaves* fleshy, flat, without nerves entire, marked with deeper spots that run into one another; *scape* the length of the leaves, round smooth, pale-green, furnished with a few scarious bracts; *raceme* few-flowered, scattered; *flowers* small, reversed, irregular; *label* dependant, flat, oblong, spurred, 3-parted, with smaller side lobes veined with crimson, and upright; the middle one notched at the end; *disk* billamellated, crimson, reddish-yellow at the axis and top.

A native of the Brazils; varying with flowers of a delicate pink and of a pale green colour. Introduced 1819.

2. ANGRÆCUM FALCATUM (falcate Angræcum). Bot. reg. t. 283. *Leaves* radical, about 5, falcately distich, equidistant, thickish, narrowly lorate, acuminate, folded into a deep clovish channel, of an opaque green colour; *scape* few

flowered; spur filiform, very large.—This species was first observed by Thunberg in Japan, near the port of Nagasaki, growing on hills among the bushes, and is probably likewise a native of China. Flowers reversed, uprightly spiked, but being set at small distances from each other, owing to their length, they afford rather the appearance of a corymb than a spike, white, but as they fade turning to a tawny yellow colour, about an inch and a half long. The spur is nearly as long as the plant itself. A native of the East Indies. Flowers in March. Introduced 1815.

3. *ANGRÆCUM LURIDUM* (lurid *Angræcum*). *Stem compressed, sheathing panicle; branches quite simple, spreading; lip 3-lobed; spur inflexed blunt emarginated.*—A very rare species with plaited leaves and conical bulbs covered with the vestiges of former leaves. A native of Sierra Leone. Introduced 1822.

This is a pretty genus, remarkable for the distinct spur to the lip; it is easily grown among loose moss in a warm damp place, but there should always be some bits of rotten wood mixed among the moss for the tender roots to adhere to.

ANGULOA.

Class 20. 1. Gynandria Monandria.
Nat. Ord. *Orchideæ*.

The Characters are—*Calyx reversed, converging; petals rather narrower than the calyx leaves; lip stalked, pitcher-shaped. 2-lobed, shorter than the calyx; anther a deciduous lid.*

ANGULOA GRANDIFLORA (large flowered *Anguloa*). H. et B. pl. æq. l. t. 27. A very elegant parasitical plant growing on the trunks of old trees; near Cuenca S. A. It is very remarkable for the beauty and grandeur of its flowers, which are of a bright yellow colour, with purple spots. The leaves are membranous, of the length of the stalk, growing immediately from the bulb, solitary, lanceolate, with several parallel nerves; *petioles* shorter than the leaves; *spathe* lanceolate caducous; *stipules* lanceolate, entire, surrounding the stem; *capsule* membranous, 1 celled, 3 valved; containing a great number of very small seeds. Flowers in July and August. This species thrives best hung up in baskets of moss, or fixed in moss to other plants, or to the stump of a tree set up for the purpose; if planted

in pots the soil should be sandy loam mixed with sticks and small pieces of potsherds, and be well drained. Introduced 1823.

ANGURIA (one of the Greek names for the cucumber. The plant now so called is also a kind of gourd).

Class Monœcia Diandria. Nat. Ord. *Cucurbitacææ*.

The Characters are—*MALE calyx, five-fid; petals 5; FEMALE calyx, five-fid; petals 5; fruit inferior, two-celled, many-seeded.*

1. *ANGURIA TRILOBATA* (three-lobed *Anguria*). Jacq. a. p. t. 234. *Leaves three-lobed.*—This plant has a very shining appearance. The leaves are alternate; the lobes oblong, acuminate, flat, entire, except that they have a few toothlets on the edge; the outer ones usually have a blunt appendicle with a terminating toothlet, resembling the rudiment of a fourth and fifth lobe. *Tendrils* the length of the leaves. *Peduncles* of the male flowers solitary from the axils, long, and bearing at the end about twenty subaggregate, sessile, inodorous, beautiful, vermilion-coloured flowers, opening successively. Native of Carthagera, S. A.; flowering there in June. Introduced 1793.

2. *ANGURIA PEDATA* (pedate-leaved *Anguria*). Plum. t. 23. *Leaves pedate, serrate.*—This is a perennial plant, climbing trees by means of long tendrils to the height of twenty feet. The old stems are woody, leafless and sarmentose; the younger ones round, pliant, smooth and leafy. *Leaves* ternate, repand-serrate, acuminate, shining, petioled, alternate; *leaflets* petioled, the middle one lanceolate, the side ones pedate, a little shorter, and frequently difform. *Peduncles* of the male flowers racemed, longer than the leaves; of the females one-flowered, round, smooth, axillary, commonly two together. *Flowers* inodorous, with orange-coloured petals. *Fruits* an inch in length, the thickness of the middle finger, green with longitudinal white streaks and shining. *Seeds* white. Native of St. Domingo. Introduced 1827.

The species of this genus grow freely on light soil, and are propagated by seeds or roots.

ANIGOSANTHUS.

Class 6. 1. Hexandria Monogynia.
Nat. Ord. *Hæmodoracææ*. Brown, p. 299.

The Characters are—*Flower tubular, incurved, with a six-parted irregular limb; stamens inserted into the mouth, ascending.*

1. ANIGOZANTHUS FLAVIDA (russet-green Anigozanthus). Bot. Mag. t. 1151. *Stem and leaves very smooth; down of the panicle deciduous; anthers with a little reflexed point.*—This singular plant is a native of the west coast of New Holland, where it was first discovered by Mr. Brown. It flowers in the Summer: the stems are from three to four feet or more in height, of a brownish purple colour. The flowers have a curious but dingy appearance; they are raised upon very long conspicuous scapes, last a long while, but have no scent.

It requires protecting in the greenhouse during Winter, and may be increased by separating the roots, which should be potted in loam and peat, and requires a good deal of water. Introduced 1803.

2. ANIGOZANTHUS RUFA (reddish Anigozanthus). Labill. t. 22. *Stem permanently downy; anthers pointless.*—The stem is two feet or more in height, round, most downy in the upper part; somewhat leafy below. *Leaves* linear, acute, narrow, entire, finely striated; *panicle* corymbose, downy; *flowers* externally covered, like the whole of the panicle, with reddish branched and tufted hairs; *stamens* dilated at the base. Native of Newfoundland, in dry sandy deserts, where it flowers in December; requires the same treatment as the first. Introduced 1824.

ANISANTHUS (derived from the inequality of the segments of the flower).

Class 3. 1. Triandria Monogynia. Nat. Ord. Irideæ.

The Characters are—*Corolla tubular; segments unequal; capsule inferior; seeds flat-winged.*

1. ANISANTHUS SPLENDENS (splendid Anisanthus). Swt. b. fl. g. n. s. t. 84. *Flowers distichous.*—It differs from *A. cunonia*, in the much greater breadth of its leaves, in their different form, and more nerves; in the flowers being all distichous, instead of secund; the nearly equal length of the valves of the spathe, which are very unequal in *A. cunonia*; in the upper segment of the flower being channelled on the upper side, instead of convex; also in its gigantic size. The bulbs of this beau-

tiful and splendid species require to be potted in a mixture of nearly half light turfy loam, one fourth of white sand, and the rest peat, in which they thrive exceedingly well. It may be increased by offsets from the bulbs, and by seeds. A native of the Cape of Good Hope. Introduced 1825.

2. ANISANTHUS CUNONIA (scarlet Anisanthus). Bot. Mag. t. 343. *Flowers secund.*—Amidst that variety of tender bulbous plants which the Cape affords, there are none whose flowers can boast a richer scarlet than this splendid plant. It has a compressed bulbous root, somewhat like that of Corn Flag, covered with a brown skin, and putting forth fibres with little bulbs at the end; from this arise several narrow sword-shaped leaves, about nine inches long, and a quarter of an inch broad in the middle, terminating in acute points; these have one longitudinal midrib which is prominent, and two longitudinal veins running parallel on each side: they are of a sea-green colour, and appear in Autumn, growing in length all the Winter; in Spring the stalk arises from between the leaves, it is round, strong, and jointed; at each joint is situated a single leaf, which almost embraces the stalk for near three inches from the base, then by the curvature of the stalk it is separated, standing erect: the stalks rise a foot and a half high, and are generally curved two opposite ways; the upper part of the stalk is terminated by a loose spike of flowers, coming out of large spathes, composed of two oblong concave leaves, terminating in acute points: these are at their first appearance imbricated, but as the stalk increases in length, they are separated; from between these two leaves come out the flowers, each having a slender suffron-coloured tube near half an inch long, which is then enlarged where the petal is divided, and the upper segment is extended two inches in length, being arched over the stamens and style. This is narrow as far as to the extent of the wings, but above them is enlarged and spread open, half an inch in length, and is concave, covering the anthers and stigmas which are extended to that length; the two wings are also narrow at their base, but are enlarged upwards in the same manner, ending in concave obtuse points, which are compressed

together, and cover the *stamens* and *style*. This flower is of a beautiful scarlet colour, and makes a fine appearance about the latter end of April or beginning of May, which is the season of its flowering. After the flowers decay, the *germ* becomes an oval smooth *capsule*, opening into three cells, which are filled with flat bordered *seeds*.

I received the seeds of this plant (in 1756) from the Cape of Good Hope, where it grows naturally; they succeeded so well in the Chelsea garden, as to produce a great number of plants, which flowered well the third season after they appeared, and continued to produce flowers, and perfect their seeds every year after. It is too tender to thrive in the open air in England, the roots must therefore be planted in pots filled with light earth, and may remain in the open air till October, when they must be removed either into an airy glass case, or placed under a hot-bed frame, where the leaves will keep growing all Winter, and in the Spring the stalks arise and flower. During the Winter season, the plants will require once a week, when the weather is mild, a little water, but it must not be given in great quantities, especially in cold weather; in the Spring they should be watered oftener; and when the flowers are past, the pots should be removed into the open air to perfect their seeds, which will ripen the latter end of June, soon after which the stalks will decay to the root, and remain inactive till September. When the stalks are decayed, the roots may be taken out of the ground, and kept in a dry room till the end of August, when they should be planted again.

This plant is easily propagated by offsets, which it sends out in great plenty, or by sowing the seeds in pots about the middle of August; they should be placed in a situation where they may enjoy the morning sun, and in dry weather should be gently watered; in September the pots may be removed to a warmer situation, and in October they must be placed under a frame, where they may be protected from frost and hard rains, but in mild weather enjoy the free air. The plants will appear in October, and continue growing all the Winter, and in June their leaves will decay; then they may be taken up, and four or five roots may

be planted in each pot, till they have grown another year, when they may be each put into a separate pot. These seedling plants must be sheltered in the same manner as the old roots in Winter, and the third year they will flower.

ANISOMELES.

Class 14. 1. *Didynamia Gymospermia*. Nat. Ord. *Labiatae*.

The Characters are—*Calyx tubular; ten-riated, five-cleft; upper lip of corolla small, entire, lower trifid, with the middle segment two-lobed; stamens inserted, ascending; anthers of the short stamens two-celled, with close cells of the longer halved or dissimilar; seeds smooth.*

1. *ANISOMELES MALABARICA* (Malabar Anisomeles). Bot. Mag. t. 2071. *Bractes filiform; leaves ovate, lanceolate, entire downwards.*—The stem is shrubby, covered with white wool, square; leaves opposite, soft, whitish; flowers verticillate; corolla bilabiate; upper lip very small, lower lip very large, trifid, middle segment two-lobed, pale purple, spotted at the base. A native of Malabar and Coromandel, and is, as we are informed by Dr. Roxburgh, esteemed a medicine of considerable virtue by the inhabitants. Flowers in July. Introduced 1817.

2. *ANISOMELES MOSCHATA* (musky Anisomeles). *The leaves elliptical, downy and hoary like the stem; flowers few in each whorl; calyx greyish, with conspicuous glands.*—A native of the tropical part of New Holland.

3. *ANISOMELES OVATA* (broad-leaved Anisomeles). Burm. zeyl. t. 71, f. 1. *The leaves ovate, subcordate, crenate; whorl many-flowered; bractes linear; calyx hairy; glands inconspicuous.*—The whole herb has a velvet like softness, owing to its fine, short, soft, depressed hairs. The seeds are beautifully polished, elliptical, and of a shining black. A native of the East Indies: flowering in July and August. Introduced 1783.

The species of this genus grows best in a rich light soil, and are readily increased by cuttings.

ANISOPETALUM.

Class 20. 1. *Gynandria Monandria*. Nat. Ord. *Orchideae*.

The Characters are—*Flowers erect; sepals conniving; the two lateral exterior large, cohering at end; two inner*

very small, subulate; lip oblong, with two teeth near the base; pollen masses, four without gland or caudiculate.

ANISOPETALUM CAREYANUM (Dr. Carey's Anisopetalum). Hook. ex. fl. t. 149. *The leaves lanceolate, keeled, solitary on their bulb; spike imbricated, radical, very little longer than the bulb.* The root is creeping here and there, producing bulbs rather larger than a pigeon's egg, throwing out from below some white, simple fibres, and above producing a single, linear lanceolate, thick dark green leaf. *Scape* springing from the base of the bulb, scarcely three inches long, with three or four brown distantly placed scales, and terminating in a dense oblong spike of flowers, about two inches in length, and which is altogether of a singularly dull and lurid brown, or chocolate colour. The structure of these flowers is highly curious; each taken separately, having no inconsiderable resemblance, both in colour and form, to the spathe of the *Pothos violaceæ*. An inhabitant of Nepaul; flowering in October. Introduced 1823.

ANODA (from a priv, and *nodus*, knot, because the pedicels are without the articulation, which is remarked in *Sida*).

Class 16. 7. *Monadelphica Polyandria*). Nat. Ord. *Malvaceæ*.

The Characters are—*Calyx* naked, five-*fid*; lobes acuminate, much spreading in fruit; capsule hemispherical beneath, depressed and stellate above, many celled, with one-celled, one-seeded divisions.

1. **ANODA HASTATA** (halbert-leaved Anoda). Cav. diss. t. 11, f. 2. *Lower leaves cordate, acuminate; upper ones hastate.*—A plant two feet in height; native of Mexico and Peru, in moist places: flowering in June and July. Introduced 1799.

2. **ANODA DILLENIANA** (Dillenius Anoda). Bot. Mag. t. 330. *Lower leaves triangular, hastate, crenate; upper ovate, lanceolate, nearly entire; peduncles solitary, axillary, length of leaves.*—It grows to the height of three feet, or more, producing during the months of July and August, a number of rose-coloured blossoms in succession, which are large and showy; the stigmata in this flower are curious objects, resembling the heads of Fungi in miniature. Mr. Aiton considers it a stove plant, but if raised early, and treated

like other tender annuals, this plant will flower and ripen its seeds in the open ground. A native of Mexico. Introduced 1725.

3. **ANODA ACERIFOLIA** (Maple-leaved Anoda). Bot. Mag. 1541. *Lower leaves cordate, angular, upper ones hastate; the rest five-lobed, halbert-shaped.*—A plant four feet in height: the flowers are small and of a blue colour. It flowers in the stove from March to the middle of Summer, and ripens its seeds freely. Is usually treated as a stove plant, but being annual, or at most biennial, the seeds may be sown in a common hot-bed early in the Spring, and the plants planted out in the open air by the latter end of May, where they will, in favourable weather, ripen their seeds, by which alone they can be propagated. A native of Mexico. Introduced 1799.

4. **ANODA TRILOBA** (three-lobed Anoda). Cav. t. 10, f. 3. *The leaves alternate; lower roundish, cordate, blunt, five-angled, upper round, hastate, acuminate.*—A plant two feet high, flowering from July to September: flowers purple. A native of Mexico. Introduced 1720.

5. **ANODA PARVIFLORA** (small-flowered Anoda). Cav. t. 431. *The lower leaves cordate, angular, upper ones halbert-shaped.*—A plant six feet high; flowers pale yellow. Native of New Spain; flowering in July and August. Introduced 1820.

6. **ANODA INCARNATA** (flesh-coloured flowered Anoda). *The lower leaves ovate-oblong, cordate, serrated, upper ones narrow, trifid.*—A perennial, varying from one to three feet in height; flowers flesh-coloured. Native of Mexico; flowering in July. Introduced 1824.

It should be kept in the stove in a mixture of loam and peat, and may be easily increased by seeds or cuttings.

ANODONTEA (from a priv, *odous* odorous, a tooth; stamens without teeth).

Class 15. *Tetradynamia Siliculosa*. Nat. Ord. *Cruciferae*.

The Characters are—*Calyx* equal at the base; stamens all toothless; silicle orbicular; valves flat or convex in the centre, somewhat inflated; seeds 2-4 in each cell.

1. **ANODONTEA EDENTULA** (toothless stamened Anodonte). W. et. K. hung. t. 92. *Stem erect; leaves oblong, velvety, upper ones linear; pods ovate,*

smooth.—This species is a native of Bosnia. It is a foot in height, with petals twice as long as the calyx. It grows on calcareous rocks, flowering in June and July. Introduced 1819.

2. *ANODONTEA DASYCARPA* (thick-podded *Anodonte*). Trev. ber. m. 1816. t. 2. *Stems erect; leaves oblong, caulescent; pods twice the length of the style.* A plant three to six inches high; flowers small, yellowish. A native of Siberia, flowering in July. Introduced 1820.

3. *ANODONTEA RUPESTRIS* (silvery rock *Anodonte*). Tenor. fl. n. t. 60. *Radical leaves oblong-lanceolate, silvery; cauline ones few, linear; pods obovate, mucronated with a short style.*—This species is six inches high, with large white flowers, which are produced in great profusion from May to September. A native of the South of Italy, on rocks. Introduced 1824.

4. *ANODONTEA HALIMIFOLIA* (*Halimus-leaved Anodonte*). All. ped. t. 54, f. 1. *The leaves narrowed at the base, covered with scaly hairs, oblong, blunt; pods orbicular, smooth, double as long as the style.*—A native of Italy, Piedmont, &c., on rocky mountains exposed to the sun; with suffruticose ascendant stems. Flowering from June to September. Introduced 1820.

5. *ANODONTEA SPINOSA* (thorny *Anodonte*). Bartel. ic. t. 808. *The leaves linear-oblong, silvery; pods orbicular, smooth, terminated by the small style.*—A little tufted shrub, six inches high, with white flowers that are produced from June to August. Native of calcareous rocks, in the South of France, Arragon, &c. The old branches and peduncles are spiny. Introduced 1683.

6. *ANODONTEA MACROCARPA* (large podded *Anodonte*). Deles. t. 41. *The leaves silvery, oblong, blunt; pods obovate-orbicular, pointed with the style, containing eight ovula.*—A native of the South of France, on calcareous rocks. It is nine inches in height, with a shrubby stem; the branches are somewhat spiny. Flowers from June to September. Introduced 1828.

The whole of the species of this genus are very proper for ornamenting rock-work or the front of flower-borders; they are all very easily increased by seeds, which ripen in abundance.

ANOMATHECA (from two greek words signifying a singular capsule).

Class 3. 1. Triandria Monogynia.

Nat. Ord. *Iridæ*.

The Characters are—*Spatha two-valved; flowers hypocrateriform; stigma three-two parted; capsule frosted over with little warts.*

1. *ANOMETHECA JUNCEA* (cut-leaved *Anomethaca*). Bot. Mag. t. 606. *Leaves broad lanceolate, rather wavy.*—In this species the *bulb* is ovate, the *leaves* issue obliquely from the earth, continue horizontal while young, and afterwards become more upright, in number four-eight, half the length of the stem. The stem varies from three inches to two feet in height; branches three-four patent. *Flowers* four-nine, hypocrateriform, upright scentless. *Spathes* very short, of a brownish livid green. *Capsule* ovate-round, rough with small thick-set glandular protuberances. *Seeds* like those of Mustard. It flowers in May, and continues long in bloom. A native of the Cape. Introduced 1791. Is propagated abundantly both by seeds and offsets; in a mixture of loam, sand, and decayed leaves, or a little peat mould may be mixed with it. After it has done flowering the bulb should be kept dry, as it is apt to rot or grow at an improper season.

ANONA (this is called by the Malays *Manao*, and at Rauda *Menona*, which it is presumed the Europeans have corrupted into *Anona*).

Nat. Ord. *Anonacæ*.

The Characters are—*Sepals 3 united at base, concave, cordate, acute; Petals 6 thick the interior thicker or none; anthers subsessile, with a dilated angular end; berry pulpy many celled towards the outside.*

1. *ANONA MURICATA* (rough-fruited Custard Apple or Sour Sop). Jac. obs. 1. t. 5. *Leaves ovate lanceolate, smooth, somewhat shining; peduncles solitary flowered.*—A middle-sized tree, rarely above twelve or fourteen, or at most twenty feet high. *Trunk* upright, with stiff, round, smooth branches, and a brownish ash-coloured bark. *Leaves* petioled, alternate, firm, stiffish; *petioles* short; *peduncles* axillary, longer than the petioles. *Flowers* coriaceous, yellow.

This species resembles the *A. reticulata*, but is not so large a tree, nor so well furnished with branches; the leaves are broader, have a smooth surface, without any furrows, and are of a shi-

ning green colour: the fruit is large, of an oval shape, irregular and pointed at top; being of a greenish yellow colour, and full of small knobs on the outside; the pulp is soft, white, and of an acid and sweet taste intermixed.

It is a native of the West Indies, and is common in every savannah of Jamaica, flowering in the spring. The large succulent fruit is agreeable to new comers, and overheated habits; but it is so common, and so much in use among the negroes, that it is now hardly ever used among the better sort of people. The smell and taste of the fruit, flowers, and whole plant, resemble very much those of Black Currants. There is a variety of it in Jamaica with inodorous leaves, larger flowers of a fulvous colour, and spherical mucronate fruits.

It was cultivated here in 1656, by Mr. John Tradescant, jun.

As the species are all natives of the hot parts of America, or the East Indies, they are too tender to live in this country, unless preserved in warm stoves; the seeds that are brought over, must be sown on a good hot-bed, or in pots of light earth, and plunged into a hot-bed of tanner's bark in February, which is the best time; that the plants may get strength before the colds of Autumn.

They should be kept in the bark-stove, and by careful management, they will make great progress; but in warm weather they should have plenty of fresh air.

As they advance in their growth, they should be cautiously shifted into larger pots and constantly remain in the tan-bed, and they will thus become vigorous; they are preserved for the sake of the beauty of their leaves, as few of them flower, and none produce fruit in England.

The stoves in which they are placed, should, during the winter season, be kept to the Ananas heat, as it is marked on the botanical thermometer. The earth should be light and rich, and the tan-bed should be frequently turned over and refreshed. In summer they should have frequent watering, but in winter they should be seldom watered, not oftener than once a week in open weather, and in frost, it will be sufficient to water them once in two or three weeks. Cuttings will root in sand, under a hand-glass, in moist heat. They should be ripe before taken off, and the leaves should not be shortened.

2. *ANONA PURPUREA* (purple petalled custard apple). Dunal. t. 2. *Leaves nearly sessile, lanceolate; rather rusty beneath; flowers axillary, almost sessile; outer petals heart shaped acute; inner roundish.*—A shrub ten to fifteen feet in height, the outer petals of a yellowish brown, the inner ones purple. A native of Mexico.

3. *ANONA HUMBOLDTII* (Humboldt's custard apple). Dunal. t. 3. *Leaves oblong, pointed, smooth, slightly dotted; stalks axillary, solitary, short, single flowered; outer petals ovate somewhat heart-shaped acute, inner bluntish.*—A shrub eight to fifteen feet high with yellowish flowers dotted with purple and red. Found by Humboldt and Bonpland, in the south American province of Cumana, where it is called *cherimolia*.

4. *ANONA LAURIFOLIA* (laurel leaved custard apple). Catesb. car. t. 67. *The leaves ovate-lanceolate, smooth; stalks solitary single flowered drooping; outer petals heart-shaped acute; inner rounded.*—A native of south America, and some parts of the West Indies. It is a shrub ten or twelve feet in height, the fruit is green, and shaped like an inverted pair. The outer petals of the flower are green; the inner white. Introduced 1820.

5. *ANONA PALUSTRIS* (shining-leaved custard apple). Plunk alm. t. 240. f. 6. *The leaves ovate oblong, very smooth; flowers solitary stalked; fruits areolate.*—Is a small tree, ten to fifteen feet in height, with round, scabrous, ash-coloured branches; and smooth, alternate, patulous twigs. The Bark is tenacious, and may be drawn out into long threads for making ropes. *Leaves* petioled, alternate, spreading, beautifully nerved, coriaceous, a little recurved. *Flowers* peduncled, yellow, the same size as in *A. muricata*. The three outer petals are veined on the outside, smooth and paler on the inside, with blood red spots at the base. The nectary consists of three petals, shorter by half than the three others, white on the outside, and of a dark blood red within. The berry or fruit heart shaped, very smooth, with a coriaceous, pulpy rind.

It grows wild in soft marshy places in Jamaica; and bears a fine sweet-scented fruit, of no disagreeable flavour; but it is said to be a strong narcotic, and is not eaten on that account. It is called

ed *alligator apple*. The wood of this tree is so very soft, even after it is dried, that it is frequently used by the country people instead of corks, to stop up their jugs or calabashes; whence it has now universally obtained the name of *Cork-wood* in Jamaica.

In Brazil it is called *Araticou do brejo* and Cortissa, where the inhabitants also make corks of the branches. They also make a kind of wine from the fruit. Introduced 1778.

6. *ANONA LONGIFOLIA* (long-leaved custard apple). Aub. t. 248. *The leaves oblong, taper pointed, smooth; flowers axillary, stalked; all the petals acute; fruit ovate, nearly globular, dotted, and reticulated.*—A shrub fifteen to twenty feet high. Flowers large, purplish. The fruit pulpy, gelatinous, and eatable. A native of Guiana on the borders of streams, also in the island of Trinidad. Flowers in May. Introduced 1820.

7. *ANONA PUNCTATA* (spotted fruited custard apple). Aub. t. 247. *The leaves ovate-oblong, acute, smooth; flowers axillary, solitary, nearly sessile; all the petals acute; fruit nearly globular slightly dotted.*—Found by Aublet in the forests of Cayenne and Guiana. A tree twenty feet high. The flowers are small and yellowish, produced in May. Fruit reddish eatable. Introduced 1820.

8. *ANONA PALUDOSA* (march custard apple). Aub. gui. t. 246. *The leaves oblong acute somewhat downy above, silky and rufous beneath; flowers greenish, on short stalks.*—A shrub four to six feet in height, found by Aublet, in boggy meadows in Guiana, flowering in November, ripening its thickly tuberculated yellow fruit in April. Introduced 1803.

ANONA SQUAMOSA (undulated custard apple, or sweet sop). Rhe. mal. 3. t. 29. *The leaves cuneolate, smooth; fruits obtusely scaled; outer petals lanceolate, smooth, inner ones minute.*—A small tree, about twelve feet in height, and is frequently rather a shrub. The trunk is smooth, and the branches spreading and round. Leaves alternate, acuminate, entire, nerved. Petioles short. Flowers peduncled, usually in pairs, green externally, whitish within, foetid. Peduncles below the petioles, longer, one-flowered. Calyx one-leaved, triangular. Petals three, excavated within at the base, dark purple, smooth. Nectary none. Filaments scarcely any.

Anthers two-valved. *Styles* short, imbricate. *Stigmas* oblong, oblique. *Berry* oval: *scales* adnate, bluish, resembling subimbricate teats. *Seeds* flattened, a little black with a white scar on the side, wrapped in a succulent cottony substance. It is a native both of the East and West Indies. The fruit is sweet, of a pleasant taste, and fragrant scent, (as big as a large apple) which is eaten by the inhabitants of tropical countries. It was cultivated in 1739, by Mr. Miller.

10. *ANONA CINERIA* (cinereous custard apple). *The leaves elliptic-oblong, almost lanceolate, dotted downy beneath; outer petals somewhat converging; fruit ovate nearly globular, scaly.*—Gathered by Ledru in the island of St. Thomas. The young branches, leaves, stalks, and flowers are clothed with a greyish pubescence. The flowers are stalked two or three together. The fruit is fleshy and eatable, in shape like a young fruit of *A. squamosa*. A shrub or tree twenty feet high. Introduced 1823.

11. *ANONA CHERIMOLIA* (cherimoyer custard apple). Bot. mag. t. 2011. *The leaves ovate-lanceolate not dotted very finely, silky beneath; outer petal downy outside.*—This tree is twenty to twenty four feet high; the stem is shrubby, and branches downy. The flower expand in the evening, and diffuses a fragrant odour, not unlike that of the flowers of *Magnolia fuscata*, fruit when ripe of a dark purple colour, the flesh soft and sweet. A native of Chili and Peru; and according to *Feuillee*, is cultivated with great care in the latter country, where it is esteemed the best fruit of the country by the creoles: but the good father remarks, that a pear or a plum is worth all the Cherimolli in Peru. Introduced 1739.

12. *ANONA RETICULATA* (netted custard apple). Rh. t. 21. *The leaves oblong-lanceolate, acute, smooth, somewhat dotted, fruits ovate, reticulate-areolate; outer petals oblong, somewhat closed.*—This species is a tree which grows to the height of twenty-five feet or more, with spreading branches; the bark is smooth and of an ash-colour. The leaves are of a light green colour, and have several deep transverse ribs, ending in acute points.

They are alternate in two rows. *Petioles* gibbous, short, excavated, smooth, *Flowers* three or four close together, peduncled, nodding whitish, the same

size as in *A. squamosa*. *Petals* three, brown on the outside, yellowish white within, spotted with dark purple, excavated at the base. The *Nectary* consists of three very minute, oblong, blunt petals, at the base of the genuine petals. The *fruit* is of a conical form, as large as a tennis-ball, of an orange colour when ripe, having a soft, sweet, yellowish pulp, the consistence of a custard, whence the name. It is a native both of the East and West Indies; and, according to Browne, the fruit is much esteemed by many people. (Swartz says, that it is seldom eaten). It was cultivated in 1690, in the royal garden at Hampton Court.

13. *ANONA MUCOSA* (narrow-leaved custard Apple). Rumph. amb. t. 45. *Leaves* oblong, lanceolate, smooth; *outer petals* spreading at the extremity; *fruit* tessellated with gibbous interstices. This tree is very like *A. reticulata* in habit and character. It is twenty-six feet in height. The flesh of the fruit is very soft, but possessing an unpleasant taste, whence in French guiana it is called *cachima morveux*, or *cachiman sauvage*. Native of South America and some parts of the West Indies. Cultivated in the Moluccas. Introduced 1819.

14. *ANONA GLABRA* (smooth custard Apple). Catesb. car. 2, t. 64. *Leaves* lanceolate, ovate, smooth; *peduncles* opposite the leaves, two-flowered.—This shrub or small tree grows to the height of about sixteen feet, covered with a smooth, greenish bark. The leaves are shaped like those of the lemon. The fruit is covered with a smooth, yellowish-green skin; the pulp is of the consistence of a ripe pear, and contains many conic, brown seeds. This is an eatable fruit, very sweet, but somewhat insipid; it is the food of the *Guanas*, and many other wild animals. Flowers in July and August. Introduced 1774.

15. *ANONA GRANDIFLORA* (great-flowered custard Apple). Dunal. t. 6. *Leaves* ovate-lanceolate, smooth, coriaceous, shining above; *stalks* axillary, solitary; *fruit* ovate, smooth, somewhat dotted.—A shrub twelve feet high. Native of the Mauritius and Madagascar. The inner petals are an inch long, being nearly equal to the outer. The calyx and back of the petals finely downy. Fruit of a middling size, rather rugged. Introduced 1825.

16. *ANONA AMPLEXICAULIS* (stem-

clasping custard Apple). Dunal. t. 7. *Leaves* oblong, heart-shaped, clasping the stem, acute, smooth; *stalks* axillary, solitary, single-flowered.—The flowers are an inch long or more, with the petals thickened towards the base, each marked on the inside with a dark purple hollow, whitish velvety on the outside. Native of the Mauritius. Introduced 1824.

17. *ANONA ASIATICA* (Asiatic custard Apple). Plum. spec. 43, ic. 143, f. 2. *Leaves* lanceolate, smooth, shining, marked with lines.—This is a middle sized tree, with spreading branches. *Leaves* quite entire, alternate, petioled; *flower* single, on binate peduncles; *petals* three, oblong-conical, incurved, erect; *germs* superior, uniting, as they ripen, into an oblong-conical fruit, five inches long, red and smooth on the outside, filled with a whitish, sweet, eatable pulp, but inferior in flavour to the fruit of *A. squamosa*. Native of the East Indies. Cultivated there and in China.

These fruits are much esteemed by the natives of the countries where they grow naturally, are esteemed very cooling and wholesome, and are frequently given to sick persons.

18. *ANONA SENEGALENSIS* (Senegal custard Apple). Deles. t. 86. *The leaves* broadly ovate, somewhat heart-shaped, coriaceous, smooth, glaucous beneath; *foot-stalks* finely downy; *flower-stalks* two or three together, lateral between the leaves.—A shrub six feet high, flowering in February and March. The petals are leathery, of a greenish yellow colour. Fruit when ripe, of a yellowish colour, containing a soft excellent tasted pulp. This fruit is much esteemed by the natives of Guiana. Native of Senegal and Guinea. Introduced 1823.

ANTENNARIA (in allusion to the awns of the pappus, which resembles the antennæ of some insects).

Class 19. 2. Syngenesia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle* serobiculate; *pappus* capillary; *involucrum* imbricated, scarious coloured; *anthers* spurred at base; *florets* diæcious.—

1. *ANTENNARIA DIOICA* (red-flowered Antennaria). Eng. Bot. t. 267. *Shoots* perennial; *stem* simple; *corymbs* crowded; *radicle* leaves spatulate; *florets* diæcious; *inner scales* of *involucrum*

elongated, obtuse, coloured.—From the crown of the root arises one simple upright flowering stem, three or four inches high, round and cottony (like the runners), clothed with alternate lanceolate leaves, and terminated by a simple corymbus of four or five flowers, occasionally white or reddish; the latter particularly are very pretty, and both retain their colour when dry, being of the tribe of *Everlastings*. Found on dry mountainous heaths, and in barren pastures of England, Scotland and Wales; flowering in June.

2. *ANTENNARIA MARGARITACEA* (pearly Antennaria). Eng. Bot. t. 2018. *Leaves linear, lanceolate, acuminate, alternate; stem branched upwards; corymbus fastigiate.*—The root is perennial, somewhat creeping. Plant two or three feet high, cottony, especially the back of the leaves. Flowers numerous, corymbose, slightly aromatic, most beautiful before they expand, the pure opaque unchangeable whiteness of the calyx being then most conspicuous. The disk is of a dull yellow.

This flower, from its purity and durability, an elegant emblem of immortality, is planted in the churchyards of South Wales, to decorate the graves of the dead; hence it becomes naturalized in such places. It is a common favourite in cottage gardens throughout many parts of England; flowering in August. A native of moist places near the banks of rivers; it also abounds in America.

3. *ANTENNARIA TRIPLINERVIS* (triple-nerved Antennaria). Bot. Mag. t. 2468. *Stem erect, simple; leaves elliptical, mucronate, amplexicaul, five-nerved.*—*ANTENNARIA TRIPLINERVIS* is a rather handsome herbaceous perennial, approaching *A. margaritacea*, and like it a good everlasting. The flowers are produced in a terminal compound lax corymb, with a small leaf-like bracte at the base of each pedicel. Involucrum forming a white ray. Florets yellow, minute and chiefly female. Flowers in September and October. Native of Nepaul; and sufficiently hardy to bear our Winter, when not particularly severe, with little or no protection. Introduced 1823.

4. *ANTENNARIA CONTORTA* (twisted-leaved Antennaria). Bot. Reg. t. 605. *Leaves linear, mucronulate, reflexed;*

corymbus few-flowered, simple or proli-ferous.—This species was originally observed by Dr. Buchanan near the town of Narainhelly in Nepal, and samples collected in the native spot are preserved in Mr. Lambert's herbarium. It is said to be in the same request for the bough-pot among the natives, as the *Everlasting's* are with us. Flowers in July. Introduced 1821.

All the species of this genus are pretty flowering herbaceous plants, very proper for adorning rock-work, or for the front of flower-borders: they are all readily increased by dividing at the root.

ANTHEMIS.

Class 19. 2. Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Involucrum hemispherical, its scales nearly equal, their margins scarious; receptacle convex, chaffy; pericarps crowned with a membranous border or pappus.*

1. *ANTHEMIS RIGESCENS* (rigid chamomile). *Leaves bipinnatifid; segments somewhat toothed, rigid; paleæ oblong, acuminate.*—Native of the Caucasus, flowering from July to September. Introduced 1805.

2. *ANTHEMIS COTA* (Venetian chamomile). *The leaves bipinnatifid; segments linear, subulate, toothed; paleæ round, pungent, dilated at base.*—An annual. Native of ploughed fields in Italy and Spain. The disk of the fructiferous flower, hemispherical, with a flat calyx the size of a plum. It is the largest of the genus; flowering in July and August. Introduced 1714.

3. *ANTHEMIS MARITIMA* (sea Chamomile). Eng. bot. t. 2370. *The leaves bipinnatifid dotted beneath; segments lanceolate entire; grains naked; stem herbaceous.*—The plant is annual, flowering in July. The stems grow prostrate, in a circular position, and are from six to twelve inches long, angular, leafy, hairy, sometimes purplish; branched and bearing several solitary flowers, on terminal downy stalks. The disk is flat, and yellow, the sharp chaffy scales of the receptacle rises above the unopened florets; radius many white. Seeds crowned with a narrow entire border.

The flowers smell like Tansy, the leaves like mugwort. It is a native of this country, of the sea shore in rocky

or stony places, but of rare occurrence. It grows wild also about Montpellier and in Italy.

4. *ANTHEMIS ALTISSIMA* [tall chamomile]. *The leaves bipinnatifid; segments lanceolate somewhat toothed; lower teeth reflexed; paleæ lanceolate, cuspidate.*—The stem is many flowered, almost overtopping the corn, streaked and erect. Annual; growing wild in the south of France, Spain and Italy. It was cultivated in 1748 by Mr. Miller.

5. *ANTHEMIS PUBESCENS* [pubescent chamomile]. *The leaves bipinnate; pinnae linear; stem erect and involucre downy; inner scales sphacelate at end.* Perennial; native of Spain and France, flowering in July and August. Introduced 1803.

6. *ANTHEMIS TOMENTOSA* [downy chamomile]. *Snow white; leaves pinnate, pinnae 3-5 fid; involucre downy; stem erect.*—Stems a foot high, one-flowered, leaves tomentose-silky. The two outer divisions of the corolla larger than the others. A native of the coasts of Greece, Italy, and France. Introduced 1795.

7. *ANTHEMIS MIXTA* [simple-leaved chamomile]. *Min. gen. t. 30, f. 1. The leaves sessile, pinnatifid; segments toothed; stem erect, branched.*—The ray of the flowers white, but yellow at the base. Annual. Grows wild in Italy and France. It was cultivated in 1731 by Mr. Miller.

8. *ANTHEMIS SEXATILIS* [rock chamomile]. *The leaves pinnate; pinnae linear, entire, sub-pubescent; floral leaves simple; branches one-headed.*—Native of Hungary. Flowers in July and August. Introduced 1807.

9. *ANTHEMIS CHAMOMILLA* [various-leaved chamomile]. *Radical leaves bipinnatifid, toothed, cauline, pinnatifid, somewhat toothed.*—Native of the South of Europe. Introduced 1807.

10. *ANTHEMIS CHIA* [cut-leaved chamomile]. *The leaves bipinnatifid, stalked; segments trifid, oblong, acute; petioles sheathing; sheaths toothed.*—Observed by Tournefort in the Isle of Chios. It was cultivated in 1731, by Mr. Miller.

11. *ANTHEMIS ALPINA* [Alpine chamomile]. *The leaves sessile, pinnatifid; segments linear, subulate, pectinate, entire; stem downy-headed.*—Perennial. Grows wild in the Tyrolese Alps,

Monte Baldo, Piedmont, &c. Introduced 1824.

12. *ANTHEMIS NOBILIS* [common chamomile]. *Eng. Bot. 980. The leaves bipinnate; segments linear, subulate, a little downy; scales of receptacle membranous, scarcely longer than the disk.*—Root perennial. *Stems* trailing, hairy. *Leaves* bipinnate, pinnae rather distant, pinnules sometimes with two or three clefts, pointed, hairy, grayish. *Flowers* solitary. *Calyx* hairy, with broad, shining, membranous edges. *Florets* of the circumference somewhat elliptical, either entire, or with two or three teeth; some of the centre yellow. Abundant in Cornwall, and in most of the dry commons in Surrey: flowering in July and August.

The leaves and flowers of common chamomile have a strong, but not ungrateful smell, with a very bitter, nauseous taste, especially the flowers, which are more bitter and considerably more aromatic than the leaves. The smell as well as the taste is rather improved by careful drying, and does not soon suffer any considerable diminution in keeping. The single flowers only should be kept, because the white florets of the ray, which are multiplied in the double flowers, are almost tasteless, and yet double flowers only are to be found in the shops. An infusion of the flowers is often used as a stomachic, and as an anti-spasmodic, but in large quantities it excites vomiting. The powdered flowers, in large doses, have cured agues, even when the bark had failed. Both the leaves and flowers possess very considerable antiseptic properties, and are therefore used in antiseptic fomentations and poultices. From their antispasmodic powers they are frequently found to relieve pain, either applied externally, or taken internally. In the London Pharmacopoeia, an extract of the flowers is directed: and besides this, they are to be found only in *Decoctum pro Enemate*, and *Decoctum pro Fomento*.

This plant may be increased by planting slips a foot asunder in the Spring, as it is hardy, it will soon cover the ground, and the gardener would do well to prefer the single-flowered kind, for the reasons above given.

13. *ANTHEMIS ARVENSIS* [corn chamomile]. *Eng. Bot. t. 602. The leaves*

bipinnatifid, their segments linear-lanceolate, pubescent; receptacle conical, its scales lanceolate; bractes crowded with the entire pappus.—Linneus thus distinguishes *this* from the *Stinking Mayweed*. "The root is biennial. The appearance and stature is the same in both, but the stalks are more diffused in *this*; the peduncles longer, with only four or five streaks or fine grooves, whereas that has about eight; the leaves are more hoary, and inodorous; the inner scales of the calyx are dilated at the tip and membranous, but in *A. Cotula* they are not at all dilated, and scarcely membranous; the chaffs in *this* are lanceolate, in *that* narrow like a bristle; the apex of the seeds in *this* is crowned with a four-cornered rim, as in *Matricaria Chamomilla*, in *that* the seeds have no crown, and terminate only in a pore."

In plants that have so much resemblance as we find in several of this class, we can scarcely be too minute in discriminating them. It is a common weed in corn, in most parts of Europe; and flowers in June and July. Was formerly planted for hedges, to cover banks, and for walks. The variety with double flowers is equally hardy, and may be increased in the same manner by slips planted in the Spring a foot asunder, that they may have room to spread, and they will soon cover the ground.

14. *ANTHEMIS AUSTRIACA* (Austrian chamomile). Receptacle conical, paleæ oblong, mucronate; grains naked; leaves bipinnate, woolly.—The root is annual, stem usually single, upright, scarcely a foot in height, round, branching into a kind of panicle. The plant has a bitter taste. The leaves, but especially the flowers, have a powerful smell of *Matriacia officinalis*, with something of the chamomile. It flowers the whole Summer. Native of Austria, by way sides and in corn-fields, sometimes covering the fallows. Introduced 1759.

15. *ANTHEMIS COTULA* (stinking chamomile). Eng. Bot. t. 1772. Leaves bipinnatifid, glabrous, their segments subulate; receptacle conical, its scales setaceous; pappus 0.—*Stinking Chamomile* or *Mayweed* is an annual plant, the whole of which is extremely fetid and acrid, so as to blister the skin of those who handle it: the acrid matter

resides in small glands, which are visible only with a microscope.

Mr. Curtis has admirably well distinguished this plant from *Matricaria Chamomilla*, which it resembles by the following circumstances. "The whole plant in *that* puts on a deep green colour, and somewhat shining appearance; *this* on the contrary assumes a much paler hue, and the stalk is often covered with a kind of woolly substance; the leaves in *Matricaria* are nearly as fine as those of Fennel, which they distantly resemble; in the *Anthemis* they are almost twice as broad, and their points, which in *that* are simple, in *this* are often bifid. The radial florets of the *Anthemis* are in general much broader, and somewhat shorter: the disk in *this* is not so prominent, but of a lighter yellow than in *Matricaria*. If the heads of *that* are bruised, they emit a strong smell, somewhat resembling that of true Chamomile, but not so pleasant; but those of *Anthemis* are intolerably disagreeable; these when handled blister the skin, which those of *Matricaria* do not. The seeds of *Anthemis* are broad, truncate, wrinkled, and deep brown; those of *Matricaria* are much smaller, paler, and different in shape." Linneus observes, that the flowers are also sometimes prolific; the disk being filled with smaller flowers, which are compound themselves, and have abundance of aphides among them. He adds, that it is a very grateful plant to toads: and Loeselius, that it drives away fleas, is very disagreeable to bees, and is given as a medicine to sheep infected with the asthma.

It has never been much in use as a medicine, nor are its effects well known. Decoctions of it are said to have been used as a bath or fomentation against hysteric suffocations, and hæmorrhoidal pains and swellings. Mr. Ray says, that it has been given internally, with success, in scrophulous cases.

It is a common weed by way sides, on dunghills, and in corn fields, where it sometimes abounds so much as greatly to diminish the crop.

Mr. Curtis very justly observes, that farmer. are not aware of the amazing increase from a single plant of this and some other weeds, which they suffer to exhaust their dunghills, in order to be dispersed afterwards

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over their fields. It flowers from May to August.

16. *ANTHEMIS FUSCATA* (brown scaled chamomile). *Receptacle sub-conical; paleæ oblong, blunt; grains naked; leaves bipinnate, linear, filiform, three-parted*.—Annual. Native of the fields of Portugal; flowering in July and August. Introduced 1805.

17. *ANTHEMIS MONTANA* (mountain chamomile). *Leaves pinnated, downy; pinnæ linear, trifid, bluntish; stem ascending; peduncles long, naked, downy*. A perennial, native of Italy and the Pyrenees; flowering from June to September. Introduced 1759.

18. *ANTHEMIS GLOBOSA* (globe chamomile). Jac. schæ. t. 371. *Leaves hairy, bipinnatifid; segments trifid, lanceolate, linear; stem nearly erect, divided*.—A native of the South of Europe, flowering in August and September. Introduced 1570.

19. *ANTHEMIS VALENTINA* (purple stalked Chamomile). *Leaves three pinnate; pinnæ linear, subulate downy; stem branched divaricating; peduncles thick*.—It grows to the height of two feet, and when allowed room, throws out many side branches, especially in good land. Stem diffused, purplish. *Peduncles* swelling at the top. *Scales* of the calyx villous; but the inner ones scarious, notched, smooth. Linnæus says that his son has observed the corollas of the florets in this species to be awned at the end.

This plant has been continued in most of the dispensaries for many ages, and is supposed to be the same which Dioscorides recommends as good for the jaundice, and to restore the skin to a good colour: but of late years, it has been entirely disused in the shops; and whenever Ox-eye has been ordered, the greater Ox-eye Daisy (*Chrysanthemum Leucanthemum*) has been used. This grows naturally in Spain, Portugal, and Provence. The flowers are yellow, but there is a variety with white flowers: both are mentioned by Breynius. There is a third with naked flowers having no rays, which Linnæus places in his genus of *Anacyclus*: but all these will rise from the seeds of the same plant, and frequently both radiate and naked flowers on the same branch. These plants not only vary in their flowers; but the leaves also are different; some being finely divided, and

others having broader segments; and this from the same seeds. Mr. Miller has figured that with yellow flowers, whose leaves are not so finely divided as those of the white; and which is supposed to be the true medical Ox-eye. Cultivated in 1621, by Mr. John Goodyer.

20. *ANTHEMIS APIFOLIA* (parsley leaved chamomile). Bot. reg. t. 527. *Leaves smooth pinnatifid; lobes cuneate, trifid or cut; heads solitary*.—A native of China, requires the protection of a green-house, where it produces a long succession of blossoms. Introduced 1819.

21. *ANTHEMIS TINCTORIA* (yellow chamomile). Eng. bot. 1472. *Leaves bipinnatifid serrated downy beneath; stem erect branched seed corymbose*.—The stem is striated, slightly hairy, much branched, a foot or two in height. Long, naked, striated, slightly-hairy peduncles terminate the stem and branches, each bearing one flower. Calyx with a green dorsal line, and white shining edges. Florets all yellow, those of the radius broad, three-toothed; of the disk numerous, short. A native of Sweden, Germany, &c. in dry open pastures. Mr. Ray found it near the river Tees, not far from Sogburn, in the bishopric of Durham. Linnæus says that the flowers are much used in Gotland in dyeing yellow.

The *yellow chamomile* or *Ox-eye* may be easily increased by sowing the seeds upon a bed of common earth in the spring; and transplanting them into large open borders, near shrubs, where they may have room to grow, for they require to be three feet distant from other plants. Some of the flowers are white, some sulphur-coloured, and some are of a deeper yellow, and in large open spots they form a pretty variety from June till November, which is the time they continue to flower. The Levant seeds produce the tallest plants, and largest flowers; but in other particulars they are the same as the European.

ANTHERICUM (a name applied by the Greeks to the stem of the Asphodel, and not misapplied to this set of plants, which in some sort resemble the Asphodel).

Class 6. I. Hexandria Monogynia. Nat Ord. *Asphodeleæ*.

The Characters are—*Sepals six*

spreading; filaments bearded; capsule ovate; seeds angular; leaves succulent fistular; flowers yellow.

1. *ANTHERICUM FLORIBUNDUM* (thick spiked Anthericum). *Leaves flat, smooth linear, lanceolate, acute; scape simple; raceme many-flowered, cylindrical, compact.*—A native of the Cape of Good Hope, where it was found by Mr. Masson. It flowers in March and April. Introduced 1774.

2. *ANTHERICUM FILIFORME* (thread leaved Anthericum). *Leaves filiform, rounded, roughish; filaments smooth; sepals lanceolate.*—This species was found at the Cape by Thunberg; flowers in April. Introduced 1774.

3. *ANTHERICUM TRIFLORUM* (three flowered Anthericum). Jac. ic. t. 410. *Leaves channelled, sword-shaped; scape simple; bractes remote three flowered.*—It flowers in November. A native of the Cape of Good Hope. Introduced 1782.

4. *ANTHERICUM FLEXIFOLIUM* (flexuose leaved Anthericum). Jac. ic. t. 412. *Leaves linear, filiform, flexuose, reflexed at base, ciliated, the length of the branched scape.*—In this species the leaves are long, and extremely rough. Scape two feet high, shaggy at the base, thin, branching. The flowers appear in May and June, they are white and rather ornamental. A native of the Cape. Introduced 1795.

5. *ANTHERICUM VESPERTINUM* (afternoon flowered Anthericum). Bot. Mag. t. 1040. *Leaves linear, ensiform, keeled three-cornered shorter than the branched scape.*—Root-stock bulbicapital; roots thick and fleshy; raceme many flowered; corolla hexapetalously parted, radiately patent; germens small and spherical. The bloom is without scent, and does not expand until after mid-day. It is a greenhouse plant of easy culture; a native of the Cape. Flowers from May to September. Introduced 1803.

6. *ANTHERICUM REVOLUTUM* (curled flowered Anthericum). Bot. Mag. t. 1044. *The leaves three cornered rough; scape branched; flowers revolute.*—A fleshy root-stock from which descends several thick fleshy subfusiform fibres or roots. Stem upright, round, compressed, paniculately and divaricately branched: racemes several, straight, many flowered. The germen is green, small, hexagonally obovate, perforated by three small pore-like apertures, from

each of which issues a small drop of crystalline liquid. A native of the Cape, flowering from September to December. Introduced 1731.

7. *ANTHERICUM GRAMINIFOLIUM* (waved leaved Anthericum). Jac. ic. t. 411. *The leaves linear, flat, depressed, shorter than the branched scape; alternate, sepals wavy.*—Flowers in June. A native of the Cape. Introduced 1794.

All the species of this genus are usually propagated by offsets taken during the Summer or Autumn. When the leaves decay, the roots should be broken up and transplanted. If the winter prove severe, they should be defended from the cold by covering the bed with straw, or what is better, old tan from a hot-bed. Thus treated, they will be strong enough to flower in one year, and in Autumn may be taken up, and planted in the borders of the flower garden, where they will last several years, if the roots be well defended from the frost.

ANTHISTIRIA (floratia. An Athenian festival, observed in honour of Bacchus, on the eleventh, twelfth, and thirteenth days of the month Anthesterion).

Class 23. 1. *Polygamia Monoecia*. Nat. Ord. *Gramineæ*.

The Characters are—*Calyx cleft at the base into four equal divisions; HERM. calyx 0; corolla two valved; stamens 3; style 2; seeds 1; MALE calyx 0; corolla two valved, beardless; stamens 3.*

1. *ANTHISTIRIA CILIATA* (ciliated Anthistiria). Lin. sup. 113. The root is annual. Culms many, a foot high, branched, jointed, smooth, nodding a little. Leaves several, alternate, smooth, except that they are scabrous about the edge, and ciliate towards the sheath; which is compressed, striated, keeled, and ciliate on the upper edge. Raceme terminating, leafy, decomposed, nodding. Partial racemes also leafy, ciliate. Peduncles lateral, in pairs, straight, filiform. A native of the East Indies.

ANTHOCERCIS.

Class 14. 2. *Didynamia Angiosperma*. Nat. Ord. *Solanææ*.

The Characters are—*Calyx 5-fid; corolla campanulate. regular; rudiment of a fifth filament; stigma capitate; capsule two celled, two valved, many seeded; the inflexed edges of the valves inserted in the placenta.*

1. *ANTHOCERCIS LITTOREA* (yellow flowered Anthocercis). Sw. fl. a. t. 17. *The leaves obovate smooth; segments of*

corolla length of tube.—It is a soft wooded small shrub, deserving of a place in every green-house; as it makes a grand appearance when covered with its elegant striped yellow flowers. The stem is suffruticose, erect, branched, from one to two feet high; branches smooth, furrowed from one leaf to the next, and terminated in a pinicle of flowers. Flowers yellow, striped with purple on the inside: produced from May to August.

Cuttings strike readily, planted under bell-glasses either in sand or mould; or if planted under hand glasses, in the open air in Spring, they will root readily. A native of New Holland. Introduced 1803.

2. *ANTHOCERSIS VISCOSA* (viscous Anthocercis). Bot. Mag. t. 2961. *The leaves alternate, obovate somewhat fleshy obtuse even retuse at the extremity, at the base attenuated, but not petioled, the margin scabrous, though not visibly so to the naked eye, the surface both above and beneath punctuated with glandular brown dots.*—This is by far the largest flowering species of the genus. It is a low shrub, with *peduncles* axillary, solitary, single flowered, having two or three linear or linear-lanceolate, green *bractæ*; these peduncles become considerably elongated when bearing the fruit. *Calyx* deeply five-cleft, with linear-lanceolate erecto-patent segments. *Corolla* ample, white, campanulate, the limb five-cleft, with spreading, oblong segments, externally with minute, glandular pubescence, the tube within streaked with green. *Stamens* four, didynamous, inserted at the base of the tube. *Anther* roundish, two-lobed, their back turned towards the pistil. *Stigma* capitate, two-lobed. It flowers in May. A native of New South Wales. Introduced 1822.

3. *ANTHOCERCIS ALBICANS* (white flowered Anthocercis). Sw. f. a. t. 16. *The leaves short, almost sessile, oblong or nearly oval, obtuse, densely clothed on both sides with a soft grey tomentum, composed of stellate fascicles of short hairs.*—A dwarf branching evergreen shrub, desirable on account of the fragrance of its very pretty flowers, which are produced in abundance in the Spring. The corolla is white, narrowly campanulate, five cleft; tube contracted at the base, and spreading at the mouth, streaked inside with several bluish pur-

ple stripes, some of which are branched.

It succeeds well in the green-house, in a mixture of sandy loam and peat. Young cutting strike root readily, planted in pots in a light sandy soil, and placed in a sheltered situation. A native of New South Wales, frequent upon pine hills in the interior, flowering in March. Introduced 1803.

ANTHOLYZA (a metaphorical name. The flower has some resemblance to the mouth of an animal, which by the aid of a little imagination, may be supposed ready to bite).

Clas 3. 1. Triandria Monogynia. Nat. Ord. *Irideæ*.

The Characters are—*Spatha* two valved; *flowers* tubular with a ringlet differently formed limb; *stigmas* three simple; *seeds* nearly round.

1. *ANTHOLYZA ÆTHIOPICA* (flag-leaved Antholyza). Bot. Mag. 561. *Leaves ensiform nerved; upper segment longest stretched forward, the others recurved.*—The bulb is large, compressed, convex, covered with a fibrous tunic; stem roundish, upright 3-4 feet high, about a third longer than the leaves; *spike* pyramidal oblong; *flowers* 10-40 scentless; *corolla* tubulous, scarlet; upper lip very large, lanceolate, short; three, alternately very short. *Capsule* the size of a small cherry, bursting when the seeds are ripe; seeds deep yellow, roundish, pressed nearly into angles from mutual juxta position. Flowers in May and June. The trivial name (given it by CORNUTZ of Æthiopian, is not a very eligible one for a plant peculiar to the Cape and adjacent countries. Introduced 1759.

2. *ANTHOLYZA PRÆLTA* (tall Antholyza). Red. l. t. 387. *Leaves linear-lanceolate, acuminate; flowers dichous, bulb depressed reticulated; bractes acuminate entire.*—This species is distinguished at first sight from the *A. Æthiopica* (which it otherwise greatly resembles) by its greater height and by the large size of the leaves. The bulb also is greater and more depressed. It makes a grand appearance when it flowers in April. A native of the Cape. Introduced 1804.

3. *ANTHOLYZA MONTANA* (mountain Antholyza). Lod. c. t. 1022. *Leaves flat, linear.*—In this species the flowers are curiously formed, and fragrant; at a little distance they have much the

appearance of an orchideous plant. A native of the Cape. Introduced 1824.

Messrs. Loddiges says "we raised it from Cape seeds, a few years since: it flourishes with us in a border, close to the front wall of the stove, in sandy peat soil, and blooms in June."

4. *ANTHOLYZA LUCIDOR* (shining Antholyza). *Radical leaves with filiform base, broad-awled, furrowed at top; stem simple, leafy, spotted.*—The root is bulbous. *Leaves* at the base of the culm, awl-shaped, narrowed at the base, as it were into a long petiole. *Scape* columnar, a foot and half high, spiked, with sessile, alternate flowers. *Spathes* bivalve, purplish. *Flowers* oblong, a little bent, purple above, cut into six lanceolate parts, a little unequal and erect. *Anthems* linear. *Style* the length of the stamens and corolla. *Stigma* trifid. A native of the Cape of Good Hope, flowering in June and July. Introduced 1825.

As these are very ornamental plants, much attention has been given to their cultivation. They do not always ripen their seeds in this country, and are therefore frequently propagated by offsets, which their bulbous roots send forth in great abundance. Miller says "the seeds should be sown after they are ripe, for if they are kept out of the ground, until the following spring, they often miscarry, or at least remain a year in the ground before they grow. If the seeds are sown in pots of light earth, and plunged into an old bed of tan, which has lost its heat, and shaded in the middle of the day in hot weather, the seeds will come up the following winter; therefore they must be kept covered with glasses to screen them from cold, otherwise the young plants will be destroyed. These may remain in the pots two years, if the plants are not too close, by which time they will have strength enough to be planted, each into a separate small pot filled with light earth. The time for transplanting these roots is in July or August, when their leaves are decayed. In summer, the pots may be placed in the open air, but in winter they must be removed, and placed under a hot-bed frame, for they are not very tender; but where any damp arises, it is very apt to occasion a mouldiness upon their leaves. The roots shoot up in autumn, and the flowers begin to appear in May; the seeds ripen in August, and soon after

their leaves and stalks decay: the roots may then be taken up, and kept six weeks or two months out of the ground, so that they may be easily transported from one country to another at that time."

ANTHOSPERMUM.

Class 22. 4. *Diœcia Tetrandria*. Nat. Ord. *Rubiaceæ*.

The Characters are—*MALE calyx, four-toothed; corolla with a short tube, and four-parted limb. FEMALE ovary, inferior; styles 2, reflexed; fruit bipartite.*

1. *ANTHOSPERMIUM ETHIOPICUM* (Amber tree). Plunk. alm. t. 183, f. 1. *Leaves polished.*—In this species the male flowers are borne on one plant, and the hermaphrodite flowers on another. The beauty of this shrub is in its small evergreen leaves, which grow as close as heath; and being bruised between the fingers, emit a very fragrant odour. The flowers, which are of a greenish-white colour, are produced in June and July. A native of the Cape. Introduced 1692.

This plant may be easily propagated by cuttings during any of the Summer months: they will take root in a border of light earth, provided they are watered and shaded as the season may require; or if these cuttings are planted in pots, and plunged into a very moderate hot-bed, they will take root sooner, and there will be a greater certainty of their growing. Afterwards they should be taken up, with a ball of earth to their roots, and planted in pots filled with light sandy earth, and exposed to the open air until October, when they ought to be removed into the conservatory; where they should be placed as free as possible from being overhung with other plants. During the winter season, they must be moderately refreshed with water, and should have as much air admitted to them as the weather will permit; for if they are kept too close, they will be subject to grow mouldy, and generally decay soon after; so that if the house is damp, it will be difficult to preserve these plants through the Winter.

They must frequently be renewed by cuttings, for the old plants seldom continue above three or four years.

ANTHOSPERMIUM.

Class 2. 3. *Diandria Trigynia*. Nat. Ord. *Gramineæ*.

The Characters are—*Glume membranous, three-flowered, lateral florets neuter, with one palea bearded; intermediate floret hermaphrodite, much shorter than the lateral ones; palea obtuse, beardless; seed free.*

1. ANTHOXANTHUM ODORATUM (sweet scented Spring grass). Eng. Bot. 647. *Spike ovate, oblong; flowers on short stalks, longer than the beard, spreading; outer glumes ciliated.*—This is easily distinguished from all our wild grasses; for besides its having only two stamens, in common with others of the genus, and each spicule containing only one flower; one valve of the calyx is small and membranous, the other large, inclosing the fructification, both pointed, and smooth or sometimes having soft white hairs scattered over them; they are also sprinkled over with minute yellow dots, similar to those of black currants, whence possibly its peculiar scent.

The usual colour of the spike is a pale yellow, whence its generic name *Anthoxanthum*. From the sweetness both of the flowers and leaves, which it imparts to new-mown hay, it has derived its specific or trivial name *odoratum*, or *sweet-scented*; that made from rye grass or other sown grasses having no such odour. From the earliness of its flowering, it has acquired its other English name of *vernal*, or *Spring grass*.

It grows in almost any kind of soil, but it seems to prefer that which is moderately dry. In a rich soil it is said that the leaves have a great tendency to curl. It is common in pastures, and also in woods, where the spikes are usually slender and loose. Towards the middle of May it is in full bloom; and about the middle of June the seed is ripe, and may easily be separated by rubbing: this grass however is not very abundant in seed.

Mr. Stillingfleet remarks, that from its being found on such pastures, as sheep are fond of, and whence excellent mutton comes, it is most likely to be a good grass for sheep pastures; that he has found it on all grounds, from the most sandy and dry to the most stiff and moist, and even in bogs; that it is very plentiful in the best meadows about London, as about Hampstead and Hendon; and that it is very easy to gather.

Mr. Curtis recommends it for its earliness, its readiness to grow in any soil or situation, and for its agreeable scent, in which it approaches the *Schoenanthus* and other odoriferous grasses of the East Indies. It retains the odour for a long time; and Boccone says, that a distilled water is prepared from it, as the vehicle of some perfumes.

It might probably be cultivated to considerable advantage, for in good meadows it grows to a reasonable height, and forms a thick tuft of tender succulent leaves at the bottom, though in point of crop it is not so productive as some other grasses. Cattle of all sorts seem to be fond of it. Mr. Curtis suggests, that probably *Poa trivialis* or common Meadow, with *Festuca elatior* or meadow Fescue, joined to this grass, would form an excellent mixture for laying down meadows.

2. ANTHOXANTHUM AMARUM (bitter Spring grass). *Panicle spike-shaped, sub-lanceolate; leaves smooth, glaucous, green; nectary adnate to the seed; corolla loose.*—Culm a foot high, flowering in July. A native of Morocco. Introduced 1810.

3. ANTHOXANTHUM OVATUM (ovate Spring grass). *Spike ovate, dense; sheaths smooth; leaves ciliated.*—A native of Spain; culm a foot high. Introduced 1821.

ANTHRISCUS.

Class 5. 2. Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Beak shorter than the seeds, even; fruit rough, with scattered prominent bristles; calyx none; petals equal, inversely heart-shaped; flower-receptacle, slightly bordered.*

1. ANTHRISCUS VULGARIS (common rough Chervil). Eng. Bot. 818. *Seeds ovate, hispid; corolla of one shape; stem smooth.*—This plant is remarkable for growing almost exclusively in the neighbourhood of large towns. The stem is two to three feet high, round, very smooth, a little swelling under each joint. Flowers small, white, all uniform, hermaphrodite. The seeds are very rough.

The banks of hedges, and other much frequented dry dusty places, abound with it in the Spring; nor does the whole vegetable kingdom afford a more exquisite green, nor scarcely a more rich and elaborate foliage, than the

young plants display in the earliest months of the year. Its beauty in that state readily distinguishes it from all its neighbours. In May the flowers are in perfection, and the herb soon sows its seeds, and withers away. It bears a near resemblance to the common Chervil (*Chærophylllum sativum*), and being gathered as such, and put into soups, by the Dutch soldiers who were in England in 1745, some of them were poisoned by it.

ANTHYLLIS (from *anthos*, a flower, and *iculus*, down, in reference to the flowers being usually downy).

Class 17. 4. *Diadelphia Decandria*. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx inflated, five-toothed, inclosing the small rounded 13 seeded legume*.

1. ANTHYLLIS GERARDI (Gerard's kidney vetch). Ger. t. 18. *Herbaceous; leaves pinnated, unequal; peduncles lateral, longer than leaf; heads leafless*. Native of Provence and Corsica, on exposed rocks and in grassy woods; flowering from June to August. The stems are many, prostrate, smooth, a foot or more in length. The leaves alternately pinnate, sub-linear; stipules the size of the leaves. Annual; flowers rose-coloured. Introduced 1806.

2. ANTHYLLIS ONOBRYCHIOIDES (St. foia-like kidney vetch). *Leaves pinnate, smooth; leaflets 7-11 linear*.—This species resembles the *A. Gerardi*, but the flowers are yellow. They grow in heads 10-12 flowered, which appear in June and July. A native of Spain. Introduced 1817.

3. ANTHYLLIS CYTISOIDES (downy-leaved kidney vetch). *Shrubby; leaves ternate, unequal; calyxes woolly, lateral*. Is a low shrub, seldom rising above two feet high, but sends out many slender branches, with hoary leaves, which are sometimes single, but generally have three oval leaflets, the middle one being longer than the other two; the flowers are yellow, and come out from the side of the branches, three or four joined together, but these are rarely succeeded by seeds in England. It is a native of Spain and the South of France, on hills and among rocks; flowering from April to June. Introduced 1731.

4. ANTHYLLIS GENISTÆ (Genista-like kidney vetch). *Leaves simple, lanceolate, nearly sessile, glabrous*.—

A shrub, one to two feet in height, much branched, branches hoary. The flowers are few, and of a yellow colour, forming an interrupted spike in the axils of the upper leaves. Native of Spain, on arid mountains.

5. ANTHYLLIS HERMANNIÆ (Hermann's or lavender-leaved kidney vetch). *Shrubby; leaves ternate, linear-cuneate, somewhat stalked; calyxes campanulate; branches spiny*.—This shrub grows five or six feet high, the branches are garnished with oblong, ternate leaves; the flowers, which are yellow, are produced in small clusters on the side of the branches; these appear in July and August, but are not succeeded by seeds in this country.

It is very remarkable that Linnæus in his elaborate work, the species Plantarum, in which he has described all the plants known to him at that time, should so very rarely have recorded the same plant by two different names; yet it has been the fate of this species to have been given, in that work, under three different genera, viz.

As palathus, *Cytissus*, and *Anthyllis*, and in one of the same author's earlier works, the *Hortus Cliffortinus*, he had before called it a *Dorycentum*.

It is a native of the Levant, generally kept in the green-house, but supposed to be sufficiently hardy to bear our ordinary winters, as Miller remarks that it was not uncommon in our gardens, till all the plants were destroyed, by the severe frost of 1739—40, after which he had not seen it. Flowers from April to July.

6. ANTHYLLIS ASPALATHI (Aspalathus-like kidney vetch). Bot. Cab. 1169. *Shrubby, much branched; branches spinouscent, glabrous; leaves almost sessile, oblong-cuneate, simple, smooth*. A native of the Island of Candia, and the Levant. It is a low prickly shrub, having many close twigs, which end in branching thorns, from whence the flowers, which are of a yellow colour, are produced: they appear in Summer with us, but do not perfect their seeds in this country.

It requires the green-house protection, and may be increased by cuttings. The soil should be loam and peat. Introduced 1754.

7. ANTHYLLIS ERINACEA (prickly kidney vetch). Bot. Mag. t. 676. *Shrubby, spiny; leaves simple*.—The height of

this truly elegant little shrub is nine or ten inches; it is covered with spines. We can sympathize with *Clusius* in the sensation he must have experienced on first discovering this little beauty, (at that time totally unknown to every other botanist) armed at all points against his invading gripe, whilst it deferred his possession, must have prolonged his pleasure, and added to the value of his prize; well might he exultingly style it "*A plant undoubtedly new and full of beauty.*" *Clusius* gave it the name of *Erinacea*, from the vulgar appellation of the inhabitants *Erigo*, which signifies a hedge-hog. It is a green-house plant, propagated by seeds, which it produces very sparingly, even in its native country. This may account for its still being a rare plant, though cultivated by *Miller* in 1759. A native of Spain, flowering from April to July.

8. *ANTHYLLIS BARBA-JOVIS* (Jupiter's beard kidney vetch). Bot. Mag. 1927. *Shrubby; leaves pinnated, equal, silky; bractes as long as globose, many-flowered heads.*—This beautiful silvery-leaved shrub was known in our gardens in the time of *Parkinson*; but being impatient of cold, and at the same time requiring a pure air, it is not so commonly met with in our green-houses as it deserves. It often grows ten or twelve feet high, and divides into many lateral branches, with winged leaves, composed of an equal number of narrow leaflets, which are very white and hairy; hence by many called *silver bush*. The flowers are produced at the extremities of the branches, collected into small heads; these are of a pale yellow colour, and appear in June; sometimes they are succeeded by short woolly pods, containing two or three kidney-shaped seeds, which, except the season proves warm, do not ripen in this country. A native of the South of France, Spain, Portugal, Italy and the East Indies. It was cultivated in 1640. Propagated by seeds or by cuttings.

9. *ANTHYLLIS HETEROPHYLLA* (various-leaved kidney vetch). *Shrubby; leaves pinnated; floral ternate.*—An under-shrub, procumbent, round, hoary, sub-pubescent. The leaves have eight pairs of leaflets, with an odd one, lanceolate, silky. Bractes sessile, remote, lanceolate, rather obtuse. Peduncles short, terminated with three

leaflets; and usually with two flowers, which are sessile, variegated, and minute. These are not succeeded by seeds in this country. Grows naturally in Portugal and Spain. It flowers in June and July; introduced 1768.

10. *ANTHYLLIS SERICEA* (wing leaved kidney vetch). Desf. t. 3. *Herbaceous; leaves pinnated equal silky; spike punctured ovate.*—A shrub, one foot in height, flowering in July and August. A native of Barbary. Introduced 1788.

11. *ANTHYLLIS MONTANA* (mountain kidney vetch). Bot. cab. t. 578. *Herbaceous; leaves pinnated equal; head terminal one sided; flowers oblique.*—This beautiful little plant the root of which is perennial, and the stems partly shrubby, is a native of the southern parts of France, Switzerland, and Austria, in elevated situations. The stems are sometimes six or eight inches in length, crooked, or keeping close to the ground. The flower-stalks are from two to three inches high.

It is tolerably hardy, and may be kept in a small pot in loamy soil. It flowers in May. Introduced 1759.

12. *ANTHYLLIS VULNERARIA* (common kidney vetch). Eng. bot. 104. *Herbaceous; leaves pinnated unequal; head double.*—The stems are nearly a foot high, not quite erect, leafy, terminated by two heads of thick set yellow flowers. One of these heads is lower than the other, and flowers earlier.

Linneus observes, that in Oeland, where the soil is a red calcareous clay, the flowers of *Anthyllis Vulneraria* are red; but that in Gotland, where the soil is white, the flowers also are white; ours are yellow. Mr. *Miller* affirms, "that having cultivated them for many years, he found that they never altered from seeds: that the leaves of the yellow-flowering Kidney Vetch are much narrower than those of the red, and have generally one or two pair of leaflets more in each; that the heads of the flowers are single in this, whereas the red has double heads; and that the root is perennial in our wild sort, whereas the other seldom lasts longer in gardens than two years, although on poor land it will sometimes continue three years."

It is a native of most parts of Europe, and flowers from May to July.

♂ The scarlet-flowering Kidney-Vetch is also found wild in several parts of Europe. Mr. *Miller* received the seeds

from Spain and Portugal; Mr. Ray says, that it is common in Italy; and we have it in Wales, both in Pembrokeshire, where it was first found by Edward Llwyd, and the isle of Anglesea, where Dillenius observed it; also in the Isle of Man.

The *Anthyllis Vulneraria* is recommended as an excellent pasturage for sheep; and Mr. Young informs us, that it abounds greatly in the best meadows of the Pyrenees: at the same time he says, that the produce is not large. With us the whole plant is dry, and looked upon as astringent. This, however, is owing to its affecting dry calcareous soils: cultivated in a rich soil, it would doubtless become more succulent, though it would probably never rival several other leguminous plants. It has been confounded by agricultural writers with Bird's-foot Trefoil (*Lotus Corniculata*), and with Liquorice-Vetch (*Astragalus glycyphyllos*).

Gesner, it seems, first raised the report of the vulnerary properties of this plant, which perhaps, like other soft and downy applications, may on an emergency staunch the blood of rustic wounds, and give nature and a good constitution time to perfect a cure.

13. *ANTHYLLIS TETRAPHYLLA* (four leaved kidney vetch). Bot. Mag. 108. *Herbaceous; leaves quaternate-pinnate; flowers lateral.*—An annual; the spontaneous growth of Spain, Italy, and Sicily, flowers in the open border in July, and ripens its seeds in September.

Long since cultivated in our gardens, but more as a rare, or curious, than a beautiful plant. Its seeds are to be sown in April, on a bed of light earth, where they are to remain; no other care is necessary than thinning them, and keeping them clear of weeds. Introduced 1640.

14. *ANTHYLLIS CORNICINA* (horny kidney vetch). Cav. ic. t. 39. f. 2. *Herbaceous; leaves pinnated, unequal; heads solitary stalked; pods hooked, blunt, shorter than the calyx.*—The stems are herbaceous, round, very hairy, as is also the whole plant, seldom erect but almost always prostrate, seven or eight inches in length. It is annual, and flowers in May and June. When it flowers early in the summer, it commonly decays soon after the seeds are ripe; whereas those plants which flower later in the season, and do not perfect seeds,

will abide another year. A native of Spain. Introduced 1759.

15. *ANTHYLLIS LOTOIDES* (lotus-like kidney vetch). Cav. ic. t. 40. *Herbaceous; cauline leaves ternate; radical, pinnate, unequal, trifid or simple.*—This is a hairy procumbent plant. Stems six inches high, somewhat erect when they flower. Flowers frequently nine in a head. Bauhin observes, that it has crooked pods resembling ravens' claws. It is annual, flowering in June and July. A native of Spain. Introduced 1739.

All the species of *Anthyllis* are very beautiful when in flower. They are well adapted for ornamenting rock-work. Most of the herbaceous species may be propagated by seeds, sown either in the Autumn or Spring in a bed of light earth, and transplanted at a proper age in the place where they are to remain. The shrubby species are commonly propagated either by seeds or cuttings; if by seeds, they should be sown in the Autumn in pots filled with light earth; and placed under a frame in winter, to protect them from frost. The following Spring the plants will rise; and when they are strong enough to be removed, they should be each planted in a small pot filled with light earth, and placed in the shade till they have taken new root; after which, they may be put along with other hardy exotic plants, in a sheltered situation, till October, when they must be removed into shelter. Young cuttings require to be planted in a pot of sand with a bell-glass placed over them, the glasses to be taken off and wiped occasionally to prevent damp.

ANTIDESMA.

Class 22. 5. *Dioecia Pentandria*. Nat. Ord.

The Characters are—*MALE calyx five-leaved; corolla 0; anthers bifid. FEMALE stigmas 5; berry cylindrical, one-seeded.*

1. *ANTIDESMA ALEXITERIA* (laurel leaved Antidesma). *Leaves oblong, narrowed at base, acuminate at end, smooth, shining on each side; racemes axillary, twin or solitary.*—It is a middle sized tree, with leaves resembling those of the lemon. Flowers are produced in May and June in racemes, fruit red, and acid like the berbery. A decoction of the leaves is reputed to be an antidote against the bite of serpents. The bark

Q Q

is used for making ropes. It is common in Malabar, is an evergreen, and continues to bear fruit to the age of seventy years; the fruit is esteemed for its pleasant cooling qualities. A native of the East Indies. Introduced 1793.

2. *ANTIDESMA PANICULATA* (panicled Antidesma). *Leaves roundish, elliptical, rounded at each end, retuse, emarginate at point, downy beneath; raceme terminal panicled.*—A native of the East Indies, flowering in May and June. Introduced 1800.

All the species require a rich loamy soil, and ripened cuttings with their leaves on, root in sand in a moist heat.

ANTIRRHINUM.

Class 14. 2. *Didynamia Angiospermia*. Nat. Ord. *Scrophularineæ*.

The Characters are—*Calyx five leaved; corolla not spurred, gibbous at base, the upper lips bifid, reflexed, lower trifid, closed by the prominent palate; capsule oblique at base, without valves, opening at the end by three pores.*

1. *ANTIRRHINUM MAJUS* (great snapdragon). Eng. Bot. 129. *Leaves lanceolate, opposite; flowers racemose; sepals glandular, hairy, ovate, blunt.*—The root is biennial and fibrous, producing spreading leafy stems. Flowering—*Stems* twelve or eighteen inches high, round, solid, smooth below, but pubescent higher up. *Flowers* in a spike, pointed one way, large and handsome, on a very short, hairy peduncle, supported by a short, concave, acuminate bracte. *Nectary* obtuse, scarcely prominent. *Capsule* obliquely opening at top, unequal at the base, vulgarly compared in shape to a calf's head. The tops of the stalks and calyxes are usually viscid. The leaves are deep green, smooth and entire, varying much in breadth.

Linnaeus makes two varieties of this species: *a.* with the stem erect, and ovate leaves. *B.* with the stem diffused and wand-like, the leaves lanceolate.

The differences in the colour of the flowers are endless. The most known are red, yellow, purple, white; red with white or yellow mouths, white and red, purple and white; purple with yellow mouths figured by Miller, t. 42. scarlet dotted with gold-colour, &c. The flowers are also sometimes double; and there is a variety with variegated leaves. Native of the southern countries of Europe, in hedges and on rocks and

ruins. With us this magnificent species of *Antirrhinum* may be found on walls, on Dover cliffs, between Northfleet and Gravesend, &c. but not originally of this country, flowers from the middle of May to the end of July.

In Russia they express an oil from the seeds, little inferior to oil of olive.

All the varieties of *Snap-dragon* are raised from seeds, which should be sown in a dry soil, not too rich, either in April or May; and in July the plants may be planted out into large borders, where they will flower the spring following; or they may be sown early in the spring, for flowering the same autumn, but then they are not so likely to endure the winter; and if the autumn prove bad, they will not perfect their seeds. Any of the sorts may be continued, by planting cuttings in the summer months, which will easily take root.

They are all pretty ornaments in the garden, and requiring very little culture, are rendered more acceptable. They are hardy plants, and will resist the cold of our winters extremely well, especially if they are planted on a dry, gravelly, or sandy soil; for when they are planted on a rich moist soil, they will grow very luxuriant for a time, but are very subject to rot in Autumn & Winter; and are much more susceptible of cold, than when they are in a dry, hungry, rocky soil; these plants will grow amongst stones, or the joints of old walls, where they may be placed so as to render some abject part of a garden very agreeable, for they will continue in flower several months; and if the seeds are permitted to shed, there will be a continual supply of young plants, without any trouble.

Wherever these plants are designed to grow on walls, or on a rocky barren soil, the seeds should be sown the beginning of March, where they are designed to remain; for if the plants are first raised in a better soil, and afterward transplanted into those places, they seldom succeed well. When the plants are come up, they will require no other culture but to keep them clear from weeds; and where they come up too thick, to pull some of them out, so as to give them room to grow. In July they will begin to flower, and will continue flowering till the frost prevents them. Those plants which grow on walls will have strong woody stems, which will

continue two to four years or more, and are rarely hurt by frost.

The variety with striped leaves is propagated by slips and cuttings, which readily take root any time in the spring or summer.

2. *ANTIRRHINUM ORONTIUM* (lesser snap-dragon). Eng. bot. 1155. *Leaves linear lanceolate ternate, flowers racemose; sepals glandular, hairy lanceolate acute.*—This resembles the great Snap-dragon in many respects. The stem is erect, hairy, and branching, but seldom more than a foot high. Leaves very entire. Flowers few, scattered, sessile, or on very short peduncles, axillary. Calyx very wide, the two lower leaves straighter, and less than the others; all lengthening after the falling of the flower. Corollas bright-purple, with a little yellow (sometimes white): spur very short. The capsule opens with three holes, the first of which is in the upper cell, and has three scales standing up below: in the lower cell are two scales on one side, and one on the other. This capsule is much shorter than the calyx, and when it opens exhibits the whimsical resemblance of the skull of an ape. It is a poisonous plant: and is sufficiently distinguished from the great Snap-dragon, in being smaller and annual, and by having long pointed leaves to the calyx. A native of England, and most parts of Europe, growing in corn-fields, and vineyards, especially in a sandy, gravelly, or chalky soil.

The specimen from which our figure was taken, was gathered at Battersea in July last. A variety is found in Norfolk with a white corolla and violet lips, which remains constant in a garden.

3. *ANTIRRHINUM ASARINA* (heart-leaved snap-dragon). Bot. Mag. 902. *Leaves opposite, cordate, unequally crenate, somewhat lobed, hairy; stems procumbent.*—This is a low, trailing, annual plant; the branches extend little more than a foot each way, and are weak, so that unless they are supported, they lie upon the ground; these have leaves like those of Ground-ivy, which grow by pairs; at the wings of the leaves the flowers come out singly on each side the stalk; they are shaped like those of Snap-dragon, but have a long tube; are of a worn-out purple colour at the top, but below of an her-

baceous colour. These come out in June, and the seeds ripen in September. It is a native of Italy and the South of France; and was cultivated in 1699, by Jacob Bobart at Oxford, and is now considered as a rare plant.

The seeds should be sown soon after they are ripe, or permitted to scatter; for when they are sown in the spring they seldom grow. They should not be transplanted, and require no other care but to keep them clean from weeds, and thin them where they grow too close. As there is not much beauty in this species, two or three plants will be enough in a garden, for the sake of variety.

4. *ANTIRRHINUM MOLLE* (soft leaved snap-dragon). *Leaves, opposite, ovate downy; stems procumbent.*—This has the stems prostrate, and brittle. Stem-leaves opposite, very soft. Peduncles longer than the calyx. Corollas villose, white with a yellow palate; the upper lip streaked with red. A native of Spain. Cultivated in 1748, by Mr. Miller.

AOTUS (from a priv. and *ota*, ears; in allusion to the want of appendages in the calyx. In Pultenæ, to which it is most nearly allied, they are very distinct).

Class 10. I. Decandria Monogynia. Nat. Ord. Leguminosæ.

The Characters are—*Calyx five cleft two lipped; stamens deciduous; ovary two seeded; style filiform; pod two valved; no appendage to the seed.*

AOTUS VILLOSA (villous Aotus). Bot. Mag. t. 949. *Calyx silky with appressed hairs; pods stalked; seeds dotted rugose; leaves rough above.*—It is a pretty little green-house shrub from one to two feet in height; and when in flower, makes a very handsome appearance. It perfects its seeds, and may be increased by cuttings, which should be put in about the beginning of April. A mixture of sandy peat three parts, and one fourth of loam, is the best soil to grow it in. A native of New Holland, and was amongst the first plants which were raised from Botany Bay seeds in this country in 1790.

APARGIA.

Class 19. I. Syngenesia Æqualis. Nat. Ord. Compositæ.

The Characters are—*Involucre imbricated with scales at the base; receptacle naked, dotted; pappus feathery, sessile, unequal.*

1. *APARGIA AURANTIACA* (orange

coloured *Apargia*). *Scape one-flowered, naked, thickened and hairy upwards; involucrem hispid; leaves lanceolate-oblong, somewhat toothed*.—A pretty little plant six inches in height, with orange coloured flowers which are produced in May and June. It is a native on the lofty mountains of Hungary. Introduced 1816. It may be increased by dividing the roots.

2. *APARGIA ALPINA* (alpine *Apargia*). Bot. cab. 539. *Scape one-flowered, squarrose, thickened and somewhat hairy upwards; involucrem hispid; leaves lanceolate, oblong, smoothish*.—A pretty little herbaceous plant, flowering in May, at the height of three or four inches. It is quite hardy, and may without difficulty be preserved in a small pot, in loamy soil, and very well deserves a place in all collections of small Alpine plants: may be increased by separating the root in the Spring. A native of grassy pastures, on the Alps of Austria. Introduced 1816.

3. *APARGIA HASTILIS* (shining leaved *Apargia*). Jac. a. t. 164. *Scape one-flowered, naked and involucrem smooth; leaves lanceolate, runcinate, toothed, smooth*.—In this species the leaves are often a foot long, tapering at the base into purplish, flat winged footstalks. The stalks are smooth, very rarely divided, twelve or eighteen inches high. The flowers are an inch and half wide, of a bright yellow colour. They are produced in July and August. A native of the south of Europe. Introduced 1796.

4. *APARGIA DUBIA* (toothed leaved *Apargia*). *Scape one-flowered, nearly naked upwards, and involucrem hairy; leaves lanceolate, toothed at base with a few forked hairs*.—A native of Germany. The stalks are mostly furnished with one small scale, and are turned under the flower, whose calyx as well as the upper part of the stalk, are beset with short forked hairs. It flowers in August.

5. *APARGIA INCANA* (hairy *Apargia*). Jac. a. t. 287. *Scape one-flowered, nearly naked, and calyx pubescent; leaves lanceolate, acute, somewhat toothed; hairs multifid*.—The root is long and woody, divided at the crown, where it bears several tufts of very hoary upright entire leaves from three to five inches long; stalks a foot high. Flowers an inch and half broad, light yellow,

produced in June and July. A native on hills and mountains in Germany, Switzerland, &c. Introduced 1784.

6. *APARGIA TARAXACI* (dandelion leaved *Apargia*). Eng. bot. 1109. *Scape single flowered, thickened upwards; leaves glabrous, runcinate-dentate; involucre very hairy*.—The root is perennial, abrupt with long lateral simple fibres. This species is very variable in the breadth of its leaves, as well as the number, height, and luxuriance of its flower stalks. The flowers are an inch broad of a full yellow with brownish terminal teeth. A native of watery pastures on the loftiest mountains of Lapland, Switzerland, Savoy, Dauphiny, Scotland and Wales.

7. *APARGIA CRISPA* (curled *Apargia*). *Scape naked, one-flowered and involucre hairy; leaves runcinate, pinnatifid, hairy; segments recurved, toothed; hairs three-forked*.—A native of rocks in Dauphiny, Switzerland, and Italy, flowering in July and August. Introduced 1803.

8. *APARGIA HISPIDA* (rough *Apargia*). Eng. bot. 554. *Scape single-flowered: Leaves dentate, scabrous; flowers hairy at their orifice, glandular at the tip*.—The root is tapering, zigzag, blackish. Flower drooping while in bud, afterwards erect, an inch and a half broad, bright yellow. In the full blown flowers the hairs from the orifice of each floret may be readily perceived. It is very common in meadows, pastures, and waste grounds, throughout Europe, from Sweden to Greece, flowering from July to September. In this country it is plentiful in pastures, on chalk or limestone soils more especially.

9. *APARGIA ASPERA* (hairy *Apargia*). *Stem leafy, somewhat branched, hairy; involucrem smooth; leaves lanceolate, runcinate, hairy; hairs forked*.—A native of rocky woods in Hungary, near the baths of Hercules, the flowers are yellow, produced in June and July. Introduced 1805.

10. *APARGIA CROCEA* (deep yellow or saffron coloured *Apargia*). *Scape one-flowered, scaly, thickened upwards and hairy; involucrem hispid; leaves runcinate, smooth, with a triangular terminal lobe*.—In this species the flowers are two inches in diameter, very handsome, and readily distinguished from all the surrounding species of its own tribe by its colour, which is that of tincture

safron. It grows on the Alpine height of Judenburg in Upper Tyria, here it inhabits dry, open, barren pastures, but is elsewhere rarely to be seen. Flowers in July. Introduced 1823.

11. *APARGIA CAUCASICA* (caucasian pargia). *Scape naked, one-flowered, scabrous; involucre hairy; leaves truncate, toothed, scabrous, somewhat hairy; stems prostrate.*—A native of grassy pastures on the Caucasian Alps, flowering in August and September. The flowers are of a full yellow. It differs from *A. alpida* in the want of hairs on the stalks, as well as in the form and position of the pubescence of the foliage. Introduced 1820.

All the species are best grown in pots as they take up less room; most of them seed freely, by which they are rapidly increased.

APEIBA (a name given by the natives of Brazil to *Apeiba Tibourbou*).

Class 13. 1. Polyandria Monogynia. Nat. Ord. *Tiliaceae*.

The Characters are—*Calyx five-lobed; petals 5; capsule echinate, many-celled.*

1. *APEIBA TIBOURBOU* (hairy Apeiba). Aub. g. t. 213. *Leaves cordate, lanceolate, serrate, hirsute beneath; capsules bristly.*—This is a middling sized tree, with a trunk seven or eight feet high, about a foot in diameter, and an irregular, chopped, soft, thick bark, fibrous and fit for making ropes. The wood is white and light. *Branches* spreading in all directions, and bent down; *twigs* villose. *Leaves* alternate, green above and wrinkled, having russet hairs underneath; they are set on short petioles. *Flowers* in racemes opposite to the leaves, consisting of alternate twigs with three or four peduncled dark yellow flowers from the top of them. The *aceme* and *peduncle* are covered with russet-coloured hairs. Native of Brazil, Guiana, the islands of Cayenne, and Tobago. *Apeiba* is the Brazilian name, and it is called *Tibourbou* by the Caribbees. Aublet found it in flower and fruit from August to October. Introduced 1756.

2. *APEIBA PETOUMO* (hoary Apeiba). Aub. gu. t. 215. *Leaves oblong, subcordate, serrulate, hoary beneath; capsules bristly.*—This is a large tree, being often forty feet high, and a foot and half or more in diameter, with a brown thick filamentose bark fit for making cordage; the wood is light and of a white colour.

The *branches* arise from the top of the trunk, and spread wide every way. *Leaves* alternate, nine inches long and four wide, entire, smooth, ending in a point, and rounded at the base, set on a petiole an inch and half in length; on each side of this is a large stipule, which soon falls. *Flowers* in racemes opposite to the leaves, with two bractes at their origin: they are divided into alternate branchlets, with a double bracte to each, and three flowers at the top, on long peduncles, surrounded by four large scales at the base. *Corolla* yellow. Native of Guiana, in the vast forests of Sinemari; bearing flowers in August, and fruit in October. It is called *Petoumo* by the Caribbees. Introduced 1817.

3. *APEIBA ASPERA* (prickly capsuled Apeiba). Aub. gu. t. 216. *Leaves oblong, subcordate, entire, pubescent beneath; capsules muricated.*—This is also a large tree, from thirty to forty feet in height, and a foot and half or more in diameter, with a grayish irregular thick filamentose bark proper for making cordage; the wood is light and white. The *boughs* are large, and divide into branches spreading in every direction. *Leaves* alternate, smooth, ending in a point, rounded at the base, five inches long and more, set on a short petiole, on each side of which at its base is a stipule, which soon falls. *Flowers* in racemes opposite to a leaf, and at the extremity of the branches; there are two bractes at the base of the raceme, and three or four scales at each division of it; at the end are three scales, from which spring three flowers; the *peduncles* and *pedicels* are hirsute. *Calyx* four or five-parted, the segments yellow above, hirsute and russet-coloured beneath. *Corolla* yellow, four or five petalled. Native of Guiana, and the island of Cayenne, flowering and bearing fruit in the month of May. This is also called *Petoumo* by the Caribbees. Introduced 1792.

4. *APEIBA LÆVIS* (smooth-leaved Apeiba). Aub. gu. t. 214. *The leaves oblong, obovate, acuminate, entire, smooth; petals obtuse; capsules scabrous.*—This is a tree of a middling size, its trunk being from ten to fifteen feet in height, and eight or ten inches in diameter, with a smooth, thin, greenish bark; the wood is white, tender, and so light that the trunk may easily be carried in one hand: the *branches*

spring from the top; both they and the *twigs* are smooth, spreading every way, and pendulous. *Leaves* ovate, acuminate, green on both sides, on short petioles. *Stipules* in pairs, short, deciduous. *Flowers* in racemes opposite to a leaf. *Corolla* greenish. Native of Guiana; flowering in May, and bearing fruit in the month of July. The inhabitants call it *Ivouyra*, and use pieces of the wood rounded and pointed to procure fire; whence the Creoles call it *Bois de Meche*. Introduced 1819.

All the species will thrive well in a mixture of loam and peat. The best way of bringing them into flower in this country, is by cutting a ring round the bark of a large branch; by this means the growth is stopped. The cuttings must be taken off when well ripened, and they should be planted in sand under a hand-glass in heat. The glass they are planted under should be lifted occasionally, so as to give a little air to the cuttings, otherwise they are apt to damp off.

APHELANDRA.

Class 14. 2. *Didynamia Angiosperma*. Nat. Ord. *Acanthaceæ*.

The Characters are—*Calyx five-parted, unequal; corolla two-tipped; anthers one-celled; capsule two-celled, two-valved, with a dissepiment crosswise; seeds without hooks.*

1. *APHELANDRA CRISTATA* (dense-spiked Aphelandra). Bot. m. t. 1578. *The leaves elliptical, oblong, acuminate, pointed, smooth on both sides, with hairy veins beneath; bractes ovate, entire; corolla smooth.*—Aphelandra *cristata* grows into a handsome tall shrub, which, when covered with its fulgid blossoms, renders it a most beautiful object. The spikes generally come out two or four together. The flowers are large, splendid, of a scarlet colour, and extremely numerous, forming dense spikes. The corolla is full two inches in length. A native of Cayenne and the Caraccas, flowering in the stove throughout August and September. Introduced 1733.

It will thrive well in a rich loamy soil, and cuttings strike root freely in a moist heat, under a hand-glass.

APHYLLANTHES (a flower without leaves).

Class Hexandria Monogynia. Nat. Ord. *Asphodeleæ*.

The Characters are—*Spathe glumaceous, imbricated; flower six-parted,*

with a spreading limb; capsule three-celled, three-valved, many-seeded.

APHYLLANTHUS MONSPELIENSIS (lily pink). Bot. Mag. t. 1132. The root is creeping; culms naked, simple, surrounded at the base with sheaths like the rush. Glume two-valved, two-flowered; the proper glume also two-valved; were it not for the corolla, it would be a rush. It grows wild about Montpellier and Nice, in barren pastures and rocky places. The bloom, which is produced in June and July, has no scent. In Provence it is known by the appellation of *Bragolou*. Introduced 1791.

It thrives well in peat soil, and is increased by seeds, or dividing at the roots.

APIARY (a place for keeping beehives, derived from the Latin *Apis*, a bee, formed like the word 'aviary').

The *proper situation* of an *Apiary* engaged the attention of antient beekeepers as much as it does in modern times, and, leaving out a few fanciful particulars, the directions given by Columella and Virgil are as good now as when they were first written.

As to the *aspect* of the *Apiary*, Virgil says—

'A station must be found
To gusts of wind impervious.'—

Milton on the contrary alleges that "it is not material in what aspect the stock stands, provided the sun shines on the hive once in the course of the day, for that well-peopled hives kept dry, will thrive in most situations."

Wildman, who paid great attention to the subject, says, "I have ever found it best to place the mouth of the hives to the West in Spring, care being taken that they enjoy the afternoon sun; the morning sun is extremely dangerous during the colder months, when its glare often tempts these industrious insects out to their ruin; whereas the mouth of the hive being then in the shade, the bees remain at home, and as clouds generally obscure the afternoon sun at that season, the bees escape the temptation of going out. When food is to be obtained, the warmth of the air round the hive continues in the afternoon, which strengthens the bees, and enables them to pursue their labours."

Dr. Evans, in his pretty poem, "The Bees," gives very similar directions—

'Screen'd from the East, where no delusive dawn
 Hills, while it tempts them o'er the dew-damp lawn ;
 But as on loaded wing the labourers roam,
 Sol's last bright glories light them to their home."

As to the mode of Construction—Dr. Bevan strongly recommends the Apiary to be roofed in by erecting a bee-house, or converting to that use some building already constructed, as preferable to an apiary out of doors, both for convenience and security, as well as ultimate profit. He thus describes his own:—The whole building, besides answering the purpose of an Apiary, may be made subservient to other uses: my own serves for storing potatoes. The potato-cellar is sunk two thirds of its depth in the earth, and the bee-house is raised upon it, having a couple of steps up to the door. The dimensions of both are seven feet six inches by six feet clear within, which affords room for five colonies.

The piles or stories of bee-boxes are placed in the bee-house at somewhat less than two feet apart, so as to make the external entrances to the several piles about a yard asunder (see plate 45).

On the inside of the house, the boxes of the upper row stand about table height, those in the lower about six inches above the floor. On the outside, the entrances to the upper row are about five feet, to the lower about three feet from the ground. The entrances through the wall may be cut in stone, bricks, or wood, and should be chamfered away on the outside, leaving the wall at those parts as thin as practicable, and letting the opening correspond in size with the outlets that are sunk in the floor-boards hereafter described. The potato-cellar is built with bricks, the bee-house of timber, lathed and plastered within, and thatched on the outside.

Where the bees enter the boxes, two wooden shelves or resting boards are fixed, two or three inches thick, to prevent warping; they extend the whole length of the building, are about a foot wide, and rest on cross pieces nailed fast to the uprights with which the bee-house is built; three cross pieces extend, also, about fifteen inches into the bee-house, where they serve as supports for the shelves on which

the bee-boxes are placed. The resting boards on the outside are divided, by bricks on the edges, into several compartments, (as shewn in plate 45); the bricks extend the full width of the resting board, and all the compartments are slated over. Thus the entrances are sheltered, and accommodation is afforded for the bees when they are at any time driven home by stress of weather in greater numbers than can readily pass through the entrances into the boxes.

The building is not only thatched at the top, but down the sides and ends, as low as the potato-cellar. On that side where the bees enter the boxes, the thatch of course terminates at the top of the compartments, over which it is spread out so as to conceal the slate coverings. The floor of the bee-house is boarded, and the potato cellar is ceiled, the space between the ceiling and the floor above being filled up with dry saw-dust.

As to the principal objects to be obtained in the construction and management of an Apiary, they are—to secure the prosperity and multiplication of the Colonies; to increase the amount of their productive labour; and to obtain their products with facility, and with the least possible detriment to the stock. The Apiary should afford to the bees the best shelter against moisture, and the extremes of heat and of cold, and especially against sudden vicissitudes of temperature; it should afford them every facility of constructing their combs, and of rearing their young; it should allow of every part of the combs being occasionally inspected, and being capable of removal when requisite; and while due attention is paid to economy, it should be made of materials that will ensure its durability.

Much ingenuity has been displayed by different Apiarians in the construction of hives, which should unite in the greatest possible degree all these advantages. Although it be in vain to hope that every one of these objects can at once be perfectly attained, yet there is still great room for improvement on the hives that are at present in common use.

Some cultivators of bees have been chiefly anxious to promote their multiplication, and to prevent the escape of the swarms in the natural way, by pro-

euring what they have termed artificial swarms, which they effected by separating a populous hive into two parts previous to its swarming, and allowing to each greater room for the extension of their works; others have contemplated only the abundance of the products which they yielded, and the facility of extracting them from the hive, without showing any particular solicitude as to the preservation of the bees themselves. Another class of Apiarians have had it more particularly in view to facilitate the prosecution of researches in the natural history and economy of bees.

Various writers have described different kinds of hives; but Mr. Huish is the latest and best writer upon this subject, and has made it apparent that the advantages which each writer asserts his own hive to possess, are much exaggerated, but that nothing is said of their inconveniences.

It would probably be impossible to proportion the hives in all cases to the magnitude of the swarms, or the energy with which they labour.

The honey taken from the oldest cells is deteriorated by an admixture of pollen, communicating to it a degree of bitterness, which it does not easily lose. It is also less in quantity, in consequence of the diminished capacity of the cells in which the cocoons of successive bees in their state of nymphæ have accumulated. The partition of hives into different stories obliges the bees to live as it were in different families, whilst their own preservation, and that of their brood, requires them to live in the strictest union.

When the upper part of the hives are flat, the moisture is retained, and this dropping down into the middle of the hive destroys both the bees and their combs.

Mr. Huish's hive is very similar in form to that used in Greece. It is a straw basket in the shape of a flower pot, that is of a broader diameter above than below. Eight pieces of well seasoned wood, about eight inches broad and half an inch thick, are laid parallel to one another at equal distances over the top of the basket, and fastened to an outer projecting band: they are then covered with net-work, over which is placed a circular board, or, what is better, a convex cover of straw extend-

ing over the whole top of the hive. This net-work obliges the bees to fasten their combs to the transverse boards by means of which each comb can easily be lifted up without interfering with any other part of the hive, or occasioning the loss of a single bee: and the whole of the interior of the hive is thus open to inspection, and are thus enabled to trace the devastations of the moth, or to ascertain the presence of any other enemy.

As to the *practice of transporting apiaries to distant places*, so as to take advantage of the seasons when different flowers are in bloom. It has been resorted to in barren countries.

In the Continent they transport bees *by land*; a method well worth imitation in many parts of this kingdom.

As many hives as a cart built for that purpose will hold, are set two and two the whole length of the cart. Over these are placed others, which make, as it were, a second story or bed of hives. Those which are stored with combs should always be turned topsyturvy. Care is taken in this stowage not to let one hive stop up another, it being essentially necessary for the bees to have air; and for this reason they are wrapped up in a coarse cloth, the threads of which being wove very wide, the air has a free passage, and lessens the heat which these insects raise in their hives, especially when they move about very tumultuously, as often happens in these carts which usually hold from thirty to forty hives.

If the season is very sultry, they travel only in the night; but a proper advantage is made of cool days. These caravans do not go fast. The horse must not be permitted to trot; they are led slowly and through the smoothest roads.

The first fields they come to serves them as an inn. The hives are taken out of the cart, then set upon the ground, and after removing the cloth from over them, the bees go forth in search of food. In the evening, as soon as they are all returned, the hives are shut up; and being placed again in the cart, they proceed on their journey. When arrived at the journey's end, the hives are distributed in the garden, or in the fields adjacent to the houses of different peasants, who, for a very small reward, undertake to look after them.

Mr. Bonner, who has had long practice in this branch of bee husbandry, advises, "when the distance is great, and there is a considerable number of hives to be transported (perhaps to the distance of six, twelve, twenty, or fifty miles) into an inland country, carriages that move on springs, are by all means to be preferred;" and recommends "the utmost care, that no opening be left for the bees to get out at, as they would be rendered so irritable by the jolting of the carriage, that they might, by stinging the horses, endanger the lives of both horses and driver: and to prevent such risks he particularly recommends water carriage, wherever it can be obtained, by sea, lakes, canals, or rivers;" and adds, that "he carried twenty hives on ship boards five hundred miles;" and that he would rather carry bee-hives four hundred miles by sea, than one hundred by land.

Floating Apiaries.—M. Maiblet relates, in his curious description of Egypt, Vol. 2. p. 24, that in spite of the ignorance and rusticity which have got possession of that country, there yet remain in it several footsteps of the industry and skill of the antient Egyptians. One of their most admirable contrivances is, their sending their bees annually into distant countries, to procure sustenance, and at a time when they could not find any at home; and their afterwards bringing them back like shepherds who should travel with their flocks, and make them feed as they go. It was observed by the antient inhabitants of Lower Egypt, that all plants blossomed, and the fruits of the earth ripened, about six weeks earlier in Upper Egypt than with them. They applied this remark to their bees; and the means then made use of by them to enable these usefully industrious insects to reap advantage from the more forward state of nature, were exactly the same as are now practised, for the like purpose, in that country.

About the end of October, all such inhabitants of Lower Egypt as possess hives embark them on the Nile, and convey them upon that river quite into Upper Egypt, calculating to arrive there at the time the inundation is subsiding, and the lands having been sown, the flowers begin to bud. The hives being come to this part of Egypt, are then placed pyramidically in boats prepared

for that purpose, after being marked and numbered by the several owners. Here the bees feed in the fields during some days, and, when it is supposed that they have got in all the honey and wax that can be met with within two or three leagues round, their conductors convey them in the same boats two or three leagues lower down, and remain there as long as is necessary to enable the laborious insects to collect all the riches of the new station. Thus the nearer they come to the place of their more permanent abode, they find the productions of the earth, and the plants which afford them food, forward in proportion. In fine, about the beginning of February, after having travelled through the whole length of Egypt, gathering all the rich produce of the delightful banks of the Nile, they arrive at the spot whence they set out, and from whence they are now returned to their respective habitations; for care is taken to keep an exact register of every district from whence the hives were sent in the beginning of the season; of their number, of the names of the particular persons who sent them, and likewise the mark or number of the boats in which they were placed.

Niebuhr saw upon the Nile, between Cairo and Damietta, a convoy of four thousand hives in their transit from Upper Egypt to the Delta.

Goldsmith describes from his own observation, a kind of floating apiary in some parts of France and Piedmont, where floating bee-houses are very common. "They have on board of one barge, three score or a hundred bee-hives, well defended from the inclemency of an accidental storm; and with these the owners float gently down the river, the bees continually choosing their flowery pastures along the banks of the stream; and thus one bee-hive yields the proprietor a considerable income. Why a method similar to this has never been adopted in England, where we have more gentle rivers, and more flowery banks than in any other part of the world, I know not; certainly it might be turned to advantage, and yield the possessor a secure, though perhaps a moderate income.

It appears, from the returns of the Custom House, that England pays annually to the North of Germany from £400,000 to £500,000 sterling for the

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wax and honey which are imported from thence, and which might very easily be raised by a more extended and judicious cultivation of bees at home.

Greater attention to this useful appendage to the cottage would not only be productive of commercial advantage, but would tend to improve the lower orders of the peasantry. It is not generally known, indeed, what profitable returns may be obtained, at a trifling expense of time and labour, by very simple processes.

Mr. Huish, the author of a valuable practical treatise on the management of bees, has made a calculation, from which he infers, that, even supposing the first cost of a swarm to be one guinea, which is the price in the places where they are sold the dearest, the cottager is almost certain, by proper care and management, of clearing, in five years, a net produce of nearly £60, and of having besides, at the end of that period, ten good stocks of bees in his garden.

As to the *adjacents* of the Apiary, the old recommendations of Virgil are as excellent as any in modern works. He says—

“Let fresh springs and ponds,
Verdant with moss, be near; and shallow
brooks,
That with swift current through the meadows run;
The neighb’ring banks may tempt them to avoid
The heat; and trees with hospitable boughs
Obvious detain them. Whether dull in ponds
The water stands, or flows in living rills;
Into the midst throw willow boughs across,
And planky stones; where, as on bridges
raised,
They may alight; and to the summer-sun
Expand their wings; if chance the eastern
blast,
Boist’rous, has sprinkled them returning
late;
Or plung’d them, blown askance, into the
waves.”

Heaths, or places abounding in wild flowers, are the best sites for an Apiary, and, in default of this, pasturage must be provided, such as gardens where flowers are cultivated, and fields in which are sown buck-wheat, clover, or saint-foin.

Under the article *BEES* directions will be given as to the management of an

Apiary, and various methods detailed of procuring honey and wax from the hives without destroying the bees themselves.

APICRA.

Class 6. 1. Hexandria Monogynia.
Nat. Ord. *Hemerocallidæ*.

The Characters are—*Perigonium petaloideum erectum regulare cylindricum, brevissime pedunculatum, laciniis 6; brevibus uniformibus apice rotundatio patulis.*

Suffrutices parvi succulenti africana (e C B S) omnium rigidissimæ, foliis tecti ut in Haworthia et induratisissimis acutioribus confertioribus et fere semper, spiraliter tortis, apice ipso aculeatimpungent. (Haworth).

1. APICRA PENTAGONA (five sided Apicra). Bot. Mag. t. 1338. *Leaves five, various and spiral, smooth, green, obsoletely spotted beneath.*—In this species the leaves are thick and the flowers grow upon tall footstalks. They make a very grotesque appearance. It is a native of the Cape of Good Hope. Introduced 1795. Propagated by suckers, planted in sandy loam.

2. APICRA IMBRICATA (rough flowered Apicra). Bot. Mag. t. 1455. *Erect rounded; corolla rugose; leaves multifarious, erect, polished, not spotted.*—The caudex is from an inch to a foot high; when stripped of the leaves slender. It is beset with leaves from the bottom, these are round and end in sharp points. The flowers grow upon tall stems which branch out, and produce long closespikes. The corolla is whitish, about half an inch long, and scentless. Blooms about August, which however it is not very free to do. Propagated by suckers. Introduced 1731.

3. APICRA FOLIOLOSA (many small-leaved Apicra). Bot. Mag. t. 1352. *Leaves multifarious, very short, and close together, orbicular, ovate, horizontal, polished, bright green.*—This species is the least leaved of all the Aloe tribe. The leaves are at the same time the thinnest, the most numerous, and the most crowded. Is propagated with difficulty, but blooms freely; it may be kept in the common green-house, where it will flower from June to August. Increased by cuttings. Native of the Cape. Introduced 1795.

All the species of Apicra are inhabitants of the green-house; they require but little water; sandy loam, mixed

with a little lime rubbish suits them best and they flower more abundantly by being exposed to the open air in summer. They are increased by suckers; or leaves, stripped off the plants and laid on a pot of mould, or planted shallow in it, will produce young plants.

APIOS (from *apion*, a pear; in reference to the form of the tubers of the roots).

Class *Diadelphia Decandria*. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx campanulate, five-toothed, the tooth under the keel elongated and acute; keel falcate linear; stamens diadelphous; stigma emarginate; legume many seeded; seeds intercepted by dissepiments.*

APIOS TUBEROSA (tuberous rooted Apios). Bot. Mag. t. 1198. *Root tuberous; leaves pinnated; leaflets five-seven ovate, lanceolate, narrowed towards the end; spike dense, shorter than leaves.*—An elegant climbing shrub with tuberous roots from which come out in the spring slender twining stalks, which rise to the height of eight or ten feet. The tubers of the roots are edible and farinaceous; they are numerous and sometimes grow to a large size. The flowers are brown and slightly sweet scented; but do not produce seeds in England. Cultivated here in 1640. Parkinson calls it *Virginia Earth-nuts*. The branches require to be supported by stakes like peas. It grows freely in common garden soil, and is easily increased by the tubers of the roots.

APIUM.

Class *Pentandria Digynia*. Nat. Ord. *Umbeliferae*.

The Characters are—*Fruit roundish, ovate, with six acute dorsal ribs; interstices flattish; petals roundish, with an inflexed point, very nearly equal; styles greatly swelled at the base; flowers receptacle, then, orbicular, wavy.*

APIUM GRAVEOLENS (Smallage or Wild Celery). Eng. bot., 1210. *Leaflets of the stem leaves wedge-shaped; stem furrowed.* The whole plant is smooth, of a pale green; the root is biennial and tap-shaped; stems widely spreading, long-furrowed, leafy; umbels terminal; flowers small, uniform, of a pale greenish white. It grows in ditches and marshes, flowering from July to September.

The fresh roots, especially in their

native watery places, are fetid, acrid, and supposed to be noxious. By drying, they lose the greatest part of their ill flavour, and become sweetish. In this state they have been employed in apozems, as aperients and diuretics. The seeds have been sometimes used as carminatives and aperients. They have a moderately strong grateful smell, and a warm bitterish taste.

Mr. Miller affirms that he cultivated Smallage forty years, to try if by art it could be brought to the same goodness as Celery; but all that he could do was to bring it to a larger size, and by earthing to give it a whiteness: it would not grow tall, nor rise with a straight stem, but sent out many suckers near the root, and, after it was blanched, retained its strong, rank taste. (In more southern climates, however, this change has been effected with success; and Ray affirms that Celery left to itself, will return after some time to Smallage.)

Smallage being a common weed by the side of ditches and brooks of water, in many parts of England, is seldom cultivated in gardens; but if any person is willing to propagate it, the seeds should be sown soon after they are ripe, on a moist spot of ground, and when the plants come up, they may either be transplanted in a moist soil, or hoed out, and left six or seven inches asunder, where they may remain for good.

APIUM DULCE (Common garden Celery). See Celery.

APOCYNUM.

Class *Pentandria Monogynia*. Nat. Ord. *Apocineæ*.

The Characters are—*Corolla campanulate, filaments five; alternate with the stamens; style 0. Stigmas broad; follicles long, linear.*

1. **APOCYNUM ANDROSEMIFOLIUM**, (Tutsan leaved Dog's-bane). Bot. Mag. 290. *Stem upright, herbaceous; leaves ovate smooth, on each side; cymes terminal smooth.*—It is a hardy perennial plant, growing to the height of two or three feet, and flowering from the beginning of July to September; leaves opposite. These and the stems abound with a milky juice, which flows out when they are broken.

In addition to the powerful recommendations of beauty and fragrance, the Tutsan-leaved dog's-bane interests us on account of the curious structure of

its flowers, and their singular property of catching flies.

The flowers of this *Apocynum* have a sweet honey-like fragrance, which perfume the air to a considerable distance, and no doubt operates powerfully in attracting insects. When a plant of this sort is fully blown, one may always find flies caught in its blossoms, usually by the trunk, very rarely by the leg; sometimes four, or even five, which is the greatest possible number, are found in one flower, some dead, others endeavouring to disentangle themselves, in which they are now and then so fortunate as to succeed; these flies are of different species—the *Musca pipiens*, a slender variegated fly, with thick thighs, is a very common victim; the *musca domestica*, or house-fly, we have never observed among the captives.

In the incomparable poem of Dr. DARWIN, intitled the *Botanic Garden*, we have the following account: "In the *A. androsæmifolium*, the anthers converge over the nectaries, which consist of five glandular oval corpuscles, surrounding the germ, and at the same time admits air to the nectaries at the interstices between each anther; but when a fly inserts its proboscis between these anthers to plunder the honey, they converge closer, and with such violence as to detain the fly." And thus this heedless insect, as THOMSON calls it, terminates its existence in captivity most miserable.

The French inhabitants of Canada say, that it is noxious to some persons, but harmless to others. Kalm relates, that he saw a soldier, whose hands were blistered all over, merely from plucking it; whereas he frequently rubbed his own hands with the juice, without feeling any inconvenience.

It is a native of Virginia, as well as Canada; and flowers from July to September. It was cultivated in 1731, by Mr. Miller; but was in the Chelsea garden much earlier, for Mr. Ray mentions its being there in 1668, under the name of *Apocynum flore Lilii convallium purpurascente*.

2. *APOCYNUM CANNABIMUM* (Hemp-like Dog's-bane). Moris. t. 3. f. 14. *Stem upright, herbaceous; leaves oblong, tomentose beneath; cymes lateral, longer than the leaves.*—The roots are perennial, creeping, whereby it increases

greatly in light dry soils, and warm situations, as even to become troublesome. Stems brown, about two feet high. Leaves smooth, in pairs, abounding with a milky juice, like the former. Towards the upper part of the stem, the flowers come out from the wings of the leaves in small bunches; they are of an herbaceous white colour, and, being small, make no great appearance; it is therefore seldom admitted into gardens, except for the sake of variety. It flowers with the foregoing, and is a native of the same countries.

The Indians of North America prepare the stalks of this species, as we do hemp, and make twine, bags, fishing-nets and lines, and linen for their own wear.

It was cultivated here in 1699, by the Duchess of Beaufort.

3. *APOCYNUM HYPERICIFOLIUM* (hypericum-leaved Apocynum). Jac. v. t. 66. *Stem erect, herbaceous; leaves oblong, cordate smooth; cymes shorter than the leaves.*—The root is perennial, creeping; stems annual, round, a foot and a half in height, filled with a white pith; leaves opposite, sharpish, quite entire, subsessile; the upper ones on the extreme twigs petioled, not revolute; peduncles umbelled, terminating; flowers small, inodorous; leaflets of the calyx oblong, concave, erect, green; corolla white, longer than the calyx. Between the filaments a roundish, green gland. The whole plant is smooth, and abounds in milk. It is a native of North America; was cultivated in 1756, by Mr. Miller; and flowers in June and July.

4. *APOCYNUM VENETUM* (Venetian Apocynum). Lobel. t. 217. *Stem erect, herbaceous; leaves elliptical, lanceolate macronate at the edge, rough with little teeth.*—The root is perennial, creeping; stems about two feet high; leaves opposite; the flowers grow erect, at the top of the stems, in small umbels, and are much larger than the former sorts. It varies with purple, and with white flowers, and they show themselves in July and August. It is a native of the islands in the Adriatic Sea, near Venice; but is supposed to have been originally brought from some other country. It was cultivated in 1690, in the royal garden at Hampton-court.

The 1st, 2nd, and 3rd sorts are pro-

agated by parting the roots in March, before they put out new stems. They are hardly enough to thrive in the open ground, but the soil should be light and dry, otherwise the roots are apt to rot in winter. They flower in July, and their stems decay to the root in Autumn, seldom ripening their seeds.

The 4th will live in the open air, provided it be planted in a warm situation, and dry soil; for although the soil in which it grows wild in Venice be moist, yet in this country the roots will rot in winter, when they are in a wet ground. The spring before the stems shoot out is the best time to remove it.

APONOGETON.

Class 6. 3. Hexandria Trigynia. Nat. Ord. *Fluviales*.

The Characters are—*An amentum composed of scales. Calyx 0; Corolla 0; Capsules four-five seeded; stamens varying from six to twelve.*

1. APONOGETON MONASTOCHYON (simple-spiked Aponogeton). Bot. Rep. 406. *Leaves oval; spike one, cylindrical.*—In this species, which is a water plant, the root is bulbous; the leaves very long, quite entire, swimming like *Potamogeton natans*. It could no more thrive with its roots and natant leaves out of that element, than an aloe or stapelia could prosper in it. It is cultivated in our hot-houses in troughs or cisterns of rich earth and clear water, in which consociated with the majestic Nymphææ, the stately Thalia, and the more humble, but not less interesting Menyanthes indica, it produces a most fragrant and desirable appearance; that perhaps is indebted for some of its charms, to the fine contrast formed by the terrestrial exotics which surrounds it.

In a collection of tropical plants, where a few cisterns of aquatics are judiciously interspersed, the oppressive heat of the stove in which they grow, is, as it is here, delusively alleviated, “in the mind’s eye, by the simple, yet cooling sight of the little pools of water in which they float. Few are the number of observers who contemplate them without imbibing pleasure. This unquestionably arises from the strong but agreeable contrast that is exhibited to the eye, by the junction of the production of the waters with those of the earth. They are vegetables of widely different orders,—productions of very different

natures,—and inhabitants of elements diametrically opposite.”

2. APONOGETON DISTACHYON (broad-leaved Aponogeton). Bot. Mag. 1298. *Spike bifid; leaves linear, oblong; floating; Bractes entire.* It is a native of the Cape of Good Hope, and found near Cape Town in most of the brooks; is very sweet scented, and flowers from April to November. As an aquatic, it is very desirable for those who cultivate these plants, the fragrance of the flowers being nearly equal to our white water lily; and this, added to the contrasted antheræ upon the pure white floral leaves, which indeed have the appearance of blossoms, give the whole an indescribable trait of beauty peculiar to itself.

3. APONOGETON ANGUSTIFOLIUM (narrow-leaved Aponogeton). Bot. Mag. t. 1298. *Spike bifid; leaves linear; lanceolate erect; bractes bipartite.*—The leaves are narrower than in *distachyon*, and tapered at each end. Flowers fine white, red at their base, two-parted almost to the bottom. The bulbs of *distachyon* are said to be eaten when roasted; so most probably are those of this closely allied species. Blooms most part of the year. A native of the Cape; grows freely in loam and peat plunged in a cistern of water. Introduced 1788.

AQUILEGIA, (from *Aquila*, an Eagle; because the claws are fancied to resemble that bird’s claws.)

Class. Polyandria pentagynia. Nat. Ord. *Ranunculacæ*.

The Characters are—*Calyx, 0; Petals, 5; Nectaries, 5; horned between the petals; Capsules, 5, distinct.*

1. AQUILEGIA VISCOSA (Clammy Columbine). Gouan. t. 19. *Spurs incurved; capsules, villous; stem few, or 1 flowered; leaves covered with viscid down; styles not longer than stamens.* The root is perennial. Stem, a foot in height, hispid, with glandular hairs.

The first root-leaf palmate-three-lobed; the divisions two-lobed or three-lobed; the other root-leaves, which are four or five in number, ternate; the leaflets equally petioled, blunt, digitate-three-parted; the lateral segments three-lobed or four-lobed; the middle ones always three-lobed. Stem-leaf one only, or seldom two, ternate; the leaflets quite entire, lanceolate, the middle one longest. Nectary curved inwards.

Capsules five, viscid, with netted veins. It varies with a short, one-flowered leafless stem; flowering in June and July.

Native of the south of France, and the mountains of Piedmont. Introduced 1752.

2. *AQUILEGIA VULGARIS* (common Columbine). Eng. Bot. 297. *Spurs incurved; capsule villous; stem leafy, many-flowered; leaves nearly smooth; styles not longer than the stamens.*—The stem is three feet high, erect, somewhat angular. The lower leaves petiolate, biternate; the leaflets roundish, trilobate, gashed, and notched; the upper ones digitate, the lobes oval and quite entire. The flowers are produced from the tops of the naked branches, and hang down; they have generally six pistils and eight nectaries.

The usual colour of the flowers in their wild state is blue, but Haller says the red is common about Berne; I have found it of the same colour near Vevay. White ones are also seen about Berne. Mr. Woodward has found both red and white flowers in Norfolk. Haller mentions double flowers occurring in the Pays de Vaud. The Columbine is found native in most parts of Europe, in woods, hedges, and among bushes. It is perennial, and flowers in June.

The Columbine is so common amongst us, and so singularly formed, that almost every child has some knowledge of the peculiarity of its formation. The elongated and incurved nectary of this flower seems to bid defiance to the entrance of the bee in search of the hidden treasure; but the admirable ingenuity of the sagacious insect is not to be thus defeated, for, on ascertaining the impracticability of effecting his usual admission, with his proboscis he actually penetrates both calyx and blossom, near the depot of honey, and thus extracts the latent sweet without further difficulty. In the Columbine the flowers vary much by culture, and become double, either by multiplying the petals or the nectaries. Of all these varieties there are subordinate variations, both in the degree of doubleness—as with two or more rows of petals, two or three rows of nectaries, curiously inserted one into the other—and in the colours, as blue, white, red, purple, flesh-coloured, ash-coloured, chestnut-coloured, and striped, or variegated blue and purple, blue and white, red and white.

From the different shape of these flowers, persons not well skilled in the culture of plants might suppose they were distinct species; but having several years sown their seeds, which were collected with great care, I have found them always varying from one to the other.

The Siberian variety, however, which is lower, and has blue corollas, with the brims of the nectaries yellow or white, is affirmed in the *Systema Vegetabilium*, to be constant.

The root, the herb, the flowers, the seeds, have been recommended to be used medicinally, on good authority; but this plant is of a suspicious tribe, and Linnæus affirms, as of his own knowledge, that children have lost their lives by an over dose of it. The sensible qualities of the seeds, says Lewis, afford little foundation for their supposed virtues in the jaundice, measles, and small-pox; as they do not seem to differ materially from those of the cold seeds, being only somewhat more mucilaginous, with a disagreeable relish. The virtues ascribed to a tincture of the flowers, as an antiphlogistic, and for strengthening the gums, and deterring scorbutic ulcers in the mouth, appear to be better founded; the tincture being made with an addition of the vitriolic acid, and differing little from our official tincture of roses. The flowers themselves, as well as the conserve and distilled water of them, directed in some foreign pharmacopœias, are insignificant.

Its increase at the root is not so great as many other plants, but it ripens seeds from which an abundant produce may be obtained. These should be sown as they are ripe, in an open but warm border, which should be kept perfectly free from weeds; and, in the following summer, the young plants may be removed into their final situation.

3. *AQUILEGIA GLANDULOSA* (glandular Columbine.) *Spurs incurved, twice as short as petals; upper part of the plant and capsules covered with glandular hair.*—A native of the Altaian mountains, where it attains to the height of two feet; flowering in May and June. There are two varieties of this species: one *a*, *discolor*, in which the petals are white, and sepals blue; the other *b*, *concolor*, petals as well as sepals, bluish-violet. Introduced 1822.

4. *AQUILEGIA VIRIDIFLORA* (green-flowered Columbine.) Jacq. t. 102. *Stems straight, longer than limb; stamens as long as petals; styles long; sepals oval, oblong, shorter than petals.*—The root is perennial. *Stems* a foot and half high; upright, slightly angular, and villous. *Leaves* biternate; leaflets frequently two-lobed, gashed, blunt, pale, green underneath. *Flowering peduncles* nodding, short; *fruiting ones* erect. *Sepals* pale green, wrinkled, shorter than the borders of the *nectaries*, which are greenish yellow within, and brownish on the outside; the border cordate-edge-shaped, the horn subulate and straight, blunt and a little bent in at the tip. The whole plant is smooth. It flowers in May, and the seeds ripen in July. Native of Siberia, where it was found by Pallas. Introduced 1780.

5. *AQUILEGIA HYBRIDA* (Hybrid Columbine.) Bot. Mag. t. 1221. *Spurs straight, longer than very blunt limb. Styles scarcely longer than stamens and petals; sepals acute, the length of petals.*—The leaves of this beautiful species are none of the purplish hue of *A. canadensis*, and are more pubescent, feeling very soft on both sides; on which account the seedling plants are readily distinguished, as they grow together; they do not, however, materially differ in form. The stem is somewhat taller, and the whole plant larger. The flowers are twice the size, with dark blue sepals, yellowish petals, and purple spurs, which are green at the top. The colours of the flowers are occasionally blue, whilst those of others are altogether white. It is a hardy perennial, flowering in May and June, and propagated by seed or parting its roots.

6. *AQUILEGIA ALPINA* (Alpine Columbine.) Bot. Cab. 657. *Spurs straight, somewhat incurved at end, twice as short as limb of petals; stem two-three flowered, leafy; leaves finely cut.*—The most showy of all the species. The stem is from a foot to two feet in height; the flowers are very large and of a most beautiful blue, with the tips of the petals yellowish green, the anterior part of the *nectaries* paler blue, and the claws of the petals whitish within. The flowering season is about the months of May or June. It is very hardy, but difficult to propagate except by seeds, which are not easily obtained of good quality. It may be kept in a pot, or planted in the

full ground, in good fresh loam. Cultivated in 1731, by Mr. Miller, who observes, "that the flowers of this are much larger than those of the garden Columbine;" and affirms "that the seeds which he sowed of this in the garden at Chelsea produced the same species, without the least variation."

7. *AQUILEGIA CANADENSIS* (Canadian Columbine.) Bot. Mag. 246. *Spurs straight; styles and stamens exerted; sepals acute, a little longer than petals; segments of leaves three-parted.*—A hardy perennial in our gardens, distinguished by the beauty of its scarlet flowers, variegated with yellow; remarkable for their long, straight, erect spurs. A native of N. America, from Canada to Carolina; flowering in April and May. It is abundant at the mouth of the Columbia river. Introduced 1640.

8. *AQUILEGIA ATROPURPUREA* (dark purple Columbine.) Bot. reg. t. 922. *Spurs straight, as long as limb; styles and stamens as long as sepals. Sepals the length of petals.* A pretty little neat, hardy, perennial, herbaceous plant; half a foot high; native of Siberia; leaves erect, on long stalks; flowers campanulate, nodding, brownish purple; sepals oblong, greenish. It flowers in the open border, in any common light soil, from April till June. Introduced 1824.

CULTURE.—These plants are all raised by sowing the seeds, or parting the old roots, but the former is chiefly practised; for the old roots are very apt to degenerate, and produce plain flowers.

The seeds should be sown in August or September, in a nursery bed. The spring following the plants will appear, when they should be constantly cleared from weeds, and occasionally refreshed with water.

Towards the latter end of May, these plants will be strong enough to transplant into a bed of good fresh undunged earth; and, in the following autumn, the roots should be carefully taken up, and planted in the borders of the flower garden, where they will flower the succeeding spring. To prevent the plants from degenerating, the flower-stem should be cut off as the flowers begin to wither. In order to keep up a succession of good flowers, fresh seeds should be sown every year, observing not to sow those that are produced from flowers.

ARABIS (native of *Arabia* according to De Theis).

Class 15. Tetradymania. Nat. Ord. *Cruciferae*.

The Characters are—*Silique linear, with flat valves, and nerved in the middle; seeds in one row in each cell.*

1. **ARABIS VERNA** (vernal wall cress). fl. græc. t. 641. *Cauline leaves cordate, stem clasping, rough, with three parted down; pedicles shorter than calyx; stigma somewhat emarginate.*—A native throughout the south of Europe in corn-fields and gravelly places; growing from four to nine inches in height. The flowers are small, of a purple colour, petals with a white claw. It flowers in May and June. Introduced 1710.

2. **ARABIS ROSEA** (rose coloured flowered wall cress). *Cauline leaves oblong, somewhat cordate, and stem clasping, scabrous, with branched hairs.*—A native of Calabria, flowering from May to July. A foot in height. Introduced 1927.

3. **ARABIS ALPINA** (alpine wall cress). Bot. Mag. t. 226. *Leaves many toothed, villous, with branched hairs, lanceolate, acute; radical somewhat stalked; cauline cordate; stem clasping.*—*Alpine wall cress* is a perennial plant, increasing very fast by its creeping roots, which run obliquely near the surface, and send out fibres at every joint. The root-leaves are collected into heads, spreading circularly: they are oblong, whitish, and indented on their edges. From the middle of these heads arise the *flowering stems*, which grow near a foot high; with leaves on them placed alternately, broader at their base than those which grow below, and closely embracing the stem. The flowers grow in loose bunches towards the top: the petals are white. This plant, in its wild state, the more open and airy its situation, the higher it grows, the more it branches, and the more hairy it becomes; in the shade it is almost smooth, quite creeping, with a single stem, the whole plant very pale, and drawn up.

Native of the Alps and other mountains of Europe, on rocks, in caverns, and in woods, flowering in April and May.

It was cultivated in the botanic garden at Oxford, in 1658: and is now become very common in gardens; being increased by parting its roots in Autumn with great facility, and esteemed for its

very early iflowering, and the pretty appearance t then makes in cold abject situations, where few other things will thrive.

Its size renders it a suitable plant for the border of a small garden, or for the covering of rock work.

4. **ARABIS ALBIDA** (white leaved or early flowered wall cress). *Leaves few-toothed, hoary; radical leaves obovate-oblong; cauline ones, cordately sagittate, clasping the stem.*—This is a native of Tauria, and was introduced in 1798. It is perennial, and is a very pleasing, early plant, producing its delicate flowers in March: (they are so hardy as not to appear to be at all affected by the rough weather often experienced at that season), and continues in blossom throughout the summer.

It may be kept in a small pot, in light loam, and increased by separating the roots.

5. **ARABIS UNDULATA** (waved-leaved wall cress). *Leaves oblong-toothed, waved, hairy; pods spreading, stem erect, hairy.*—It resembles *A. albida*, but the whole plant is smaller in all its parts, and the leaves less hoary. A perennial, although in some books it is called annual. It is of very low growth, and flowers in April, is a proper plant for rock work. Its early pure white flowers make it acceptable for a pot, among the herbaceous collection.

It increases without difficulty, and should be potted in light loam. A native of the south of Europe. Introduced 1823.

6. **ARABIS LONGIFOLIA** (long-leaved wall cress). *Leaves toothed, hoary, with branched hairs; lower ones obovately-oblong, on long stalks; cauline ones oblong, stem clasping.*—A tufted plant producing its white flowers from May to August. A native of Persia. Introduced 1820.

7. **ARABIS MOLLIS** (soft wall cress). *Leaves pubescent, with small stellate hairs; lower ones cordate-roundish on long petioles; cauline ones ovate-cordate, stem clasping.*—A plant two feet in height, having the appearance of *Alliaria officinalis*; flowers white; blooms from May to August. Introduced 1823.

8. **ARABIS TOXOPHYLLA** (bow-leaved wall cress). *Leaves pubescent, with minute stellate down; radical oblong, stalked, sinuate, toothed; cauline sagittate,*

lanceolate, entire.—An elegant species, foot in height, with white flowers, about the size of those of *A. alpina*. A native of sunny fields on the Volga. Introduced 1828.

9. *ARABIS AURICULATA* (auricled wall cress). *Leaves somewhat rough, with branched hair; lower oval, narrowed into stalk; cauline bluntly cordate auricled*.—There are several varieties of this species which is a native of the south of Europe, flowering in May. Flowers white. Introduced 1805.

10. *ARABIS CRISPATA* (crisp leaved wall cress). *Leaves acutely toothed, lanceolate, stem-clasping, wavy, rough with branching hairs; radical narrowed into the stalk*.—A tufted plant six inches high, with white petals; flowering in May. A native of Carniola. Introduced 1816.

11. *ARABIS SAGITTATA* (arrow-leaved wall cress). *Leaves somewhat toothed, rough; radical, ovate, or oblong, narrowed into the stalk; cauline lanceolate, sagittate, cordate*.—A very variable plant, even in the same situations. The flowers are white, and produced from May to July. It is a native throughout the northern parts of Europe, in rugged places, among stones, &c.

12. *ARABIS HIRSUTA* (hairy wall cress). Eng. bot. 587. *Leaves toothed, rough, with generally branched hairs; radical obovate, oblong, narrowed into the stalk; cauline ovate, lanceolate*.—It has been found in several parts of Great Britain, but is by no means common. It is also a native of middle and northern Europe and of North America. The root is strong, woody, and perennial. Stems several, one of which is much stronger than the rest, erect, a foot high, clothed with thick set prominent hairs; flowers small, white; pods long, numerous, erect, beaded as it were by the projecting seeds, rather blunt at the top, and crowned with the almost sessile stigma. Flowers from May to July.

13. *ARABIS STRICTA* (Bristol wall cress). Eng. bot. 614. *Leaves rough with scattered bifid down; radical obovate toothed; cauline oblong, nearly entire; raceme erect*.—Few of our plants are so local as this. It is not certainly known to grow in any other part of Britain than on St. Vincent's rocks near Bristol. It is principally to be met with about a mile below the hot-wells

on the opposite sides of the river, growing on the more inaccessible parts of the rock, and there but in small quantity. It is a tufted plant with cream coloured flowers. Petals twice as long as the calyx, obtuse, erect, by which this species is readily distinguished. Flowers from May to July.

14. *ARABIS CILIATA* (ciliated wall-cress.) Eng. bot. t. 1740. *Leaves somewhat toothed, smooth, ciliated; radical subsessile, oval, oblong; cauline oblong; raceme erect*.—The root is biennial; stem, one or more, from two to twelve inches high, leafy; leaves fringed, with simple or forked hairs, a few of which are often clustered into a little tuft or beard at the tips; flowers white, in a simple *corymbus*, very soon becoming a long cluster of linear, narrow, rugged, shining pods, each crowned with the very short conical style and capitate stigma. The more evidently the leaves are toothed, the less they seem to be fringed. A native of Ireland flowering in July and August.

15. *ARABIS THALIANA* (common-wall cress). Eng. bot. t. 901. *Leaves ovate, somewhat toothed; radical stalked, ovate oblong; stems branched; pods ascending*.—The root is annual, tapering, fibrous. The root-leaves are oblong-ovate, petioled, commonly entire, but sometimes toothed, especially near the base, hairy rough on both sides, with little prominent points. Stem-leaves sessile and toothed; the hairs at the base simple, at the edges and on the surface two-forked or three-forked; stem upright, somewhat branched, round, crooked; from two to ten inches high; covered with a bloom, hairy; the little branches alternate and drooping; calyx slightly hairy; petals white, twice the length of the calyx, entire and blunt; silique half an inch long, containing several yellowish seeds. The glands are so minute as scarcely to be discerned with a common magnifier. This is an annual plant, varying much in size, from two inches to a foot and more, and partakes of the pungent flavour of its class, but is not remarkable for any peculiar quality. It grows frequently among the corn on sandy ground, and also on walls; flowering in March and April, and after scattering its seed in May it soon withers and disappears.

16. *ARABIS SERPYLLIFOLIA* (thyme-leaved wall-cress.) Vill. dauph., t. 37.

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Leaves nearly entire, rough, with branched hairs; radical and cauline oval, narrowed at base; raceme lax. The stems are weak, filiform, bending and entangled one with another; *leaves* small, sessile, beset with cloven hairs; *petals* white, small, within a converging yellowish calyx; *siliques* very thin, a little compressed; *seeds* brown, a little lengthened out and flattened. Biennial. Native of Dauphine. Flowers in June and July. Introduced 1820.

17. *ARABIS LYRATA* (lyrate wall-cress.) *Radical leaves lyrate, smooth, or ciliated; cauline linear; stem hispid at base, somewhat branched.*—The flower-stalks rise near a foot high, and are terminated by white flowers. Native of North America in cultivated fields and dry hills, particularly on rocks in Pennsylvania, and extending westwards to the rocky mountains. It flowers in May and June. Introduced 1823.

18. *ARABIS PETRÆA* (short-podded wall-cress.) Eng. bot. t. 469. *Leaves nearly smooth, radical cut; cauline oblong; linear entire; stem generally branched.*—There are many varieties of this species growing on mountains, in fissures of rocks, and among stones. They are little tufted plants, with white flowers, flowering in June and July. Native of many parts of Europe, also in the island of Unalaschka.

19. *ARABIS HALLERI* (Haller's wall-cress.) Wal. and Kit. t. 120. *Lower leaves lyrate, stalked; terminal lobe ovate; stem clothed with soft villi; pedicels and pods spreading.* The stem erect, six inches high; *root leaves* on long petioles, smooth, obtuse, repand, with a small tooth or two at bottom; *stem-leaves* simple, on short petioles, oblong, sinuate-toothed, rather acute; *branches* with few leaves and few flowers; *calyx* greenish; *petals* white, with green claws. This has runners from the root and the base of the stem. Native of Germany, Carniola, and Piedmont; in moist mountainous places, near rivulets. Flowering in May and June. Introduced 1816.

20. *ARABIS TURRITA* (tower-wall-cress.) Eng. bot. t. 178.—*Leaves embracing the stem; pods bent backwards, flat and linear; with an incrassated margin.*—The root woody and biennial; *stem* full a foot high, simple, upright; *leaves* pale green, dentated, roughish; the *radical ones* ovate, lengthened out

at their base; those on the stem embracing it more than half round; *flowers* pale sulphur-coloured, in a leafy spike. Native of Spain, France, Switzerland, Italy, Sicily, and Transylvania on mountains, in hedges and coppices, also in Britain, on old walls, particularly on the college walls of Oxford and Cambridge. Flowering in May and June.

21. *ARABIS PENDULA* (pendulous podded wall-cress.) Jacq. vind. t. 34. *Leaves clasping the stem, toothed, oblong, cordate, at the base dilated; pedicels three times longer than the calyx.* A native of Siberia, near the river Lena, flowering in May and June. Its stem is near a foot in height, rough, with scattered stiff hairs; *leaves* rough; *peduncles* long, filiform, loose; *calyx* hirsute at the tips; *corollas* white; *siliques* smooth, nodding, loose. Native of Siberia. Cultivated in 1750.

Nuttall describes a variety of this species as native of North America, on the borders of the river Missouri, near Fort Mandan.

22. *ARABIS LUCIDA* (shining-leaved wall-cress.) *Leaves shining, clasping the stem.*—The stem is four inches high, quite simple, round, smooth; *leaves* quite entire, and of some consistence; the bottom ones obovate, petioled, obtuse; those on the stem, alternate, embracing, cordate, or cordate oblong; *corymb* terminating, becoming racemose; *calyx* smooth, gaping; *petals* almost erect, white, linear, entire, twice as long as the calyx, narrower at the base; *stamens* the length of the petals; *stigma* obtuse. It is a perennial plant; native of Hungary. Flowering in June and July. Introduced 1793.

23. *ARABIS CANADENSIS* (Canada or sickle-podded wall-cress.) Plum. t. 86. f. 8. *Cauline leaves sessile; pedicels three times longer than the calyx; pods linear, pendulous, somewhat ciliated; seeds with a very broad wing.*—The stem is erect, from a foot to two feet in height, smooth; *leaves* broad-lanceolate, serrate, with four or five small, thick, remote teeth on each side. Raceme terminating, naked; and from the upper axils two or three lateral racemes. Native of North America, in shady rocky situations, from Canada to Virginia. Flowering from May to July. Introduced 1768.

24. *ARABIS BELLIDIFOLIA* (Daisy-

aved wall-cross.) Jacq. fl. a. t. 280. *Leaves smooth, almost entire; radical ones obovate; stem ones ovate; racemes erect; pedicels three times longer than the calyx; pods four times longer than their pedicels.*—The root is perennial, producing several stems and tufts of leaves, which are dark green, thickish, shining, sometimes quite smooth, sometimes rough with dots, ending in a short air. Stems undivided, lengthened out gradually at top into a long raceme; flowers corymbed, inodorous; calyx greenish yellow; petals white, twice as long as the calyx; *siliques* parallel to the stem; the valves are not rolled back, but open at both ends, and fall off. Native of the foot of the Alps in Switzerland and Austria in moist places. Flowering in May and June. Introduced 773.

ARABIS ARENOSA (Gravel wall-cross.) Hook. ex. f. t. 221. *Leaves villose, with forked hairs; radical ones lyrate-pinnatifid; stem ones deeply toothed.*—A very desirable plant in our gardens, for its blossoms early in April, and makes a very beautiful appearance, with its deeply cut dark-green leaves, and large showy flowers, of a pale lilac colour; very rarely white or bluish. It is an annual which may probably safely be cultivated in the open air, yet it may be as well for the young plant to be kept during winter under a common frame. A native of Middle Europe, &c. in gravelly places, and on rocks. Introduced 1789.—The species of this genus are very proper for rock work. *A. albida, alpina, arenosa, &c.* will answer also for the front of flower borders, as they flower earlier than most border flowers. They are all readily increased by seeds or cuttings.

ARACHIS (*Aracos*, a name applied by Pliny to a plant which had neither stem nor leaves, but was all root, the present plant, however, has nothing to do with the plant of Pliny.)

Class Diadelphia Decandria. Nat. Ord. Leguminosæ.

The Characters are—*Calyx two-lipped; corolla resupinate; filaments united; legume, gibbous, torulose, veiny, coriaceous.*

ARACHIS HYPOGÆA (American Earth-nut.) Trew. pl. rar. t. 3. *Branches diffusely procumbent.*—The stem is herbaceous annual, three feet high, round, very hairy, reddish, suberect;

leaves scattered, petioled, abruptly pinnate; leaflets two pairs, ovate, hairy, quite entire, on short petioles; stipules sharp, bifid, opposite, half-stem-clasping; flowers gold coloured, heaped, axillary, growing singly on very long, slender peduncles; many of them are male, mixed with the hermaphrodites. The legumes contain three or four seeds. Native of the East Indies, and cultivated very abundantly in China and Cochinchina.

β. The African Ground-nut differs from the Asiatic, described above, in having the *leaflets smooth, the stipules entire; the flowers* usually in pairs on shorter *peduncles*, and only two or three *seeds* in each *legume*. This occurs in various parts of eastern Africa.

All the European settlements in America now abound with the Ground-nut, but it is generally supposed that it was originally brought by the slaves from Africa. In South Carolina there is great plenty of this plant; the inhabitants roast the nuts, as they are commonly called, and make use of them as chocolate. In the eastern countries they are a substitute for almonds. They abound in a thin limpid oil proper for lamps, and it is much used for this purpose in Cochinchina; it supplies the place also of their oil of olives for the use of the table, but it is inferior to it in flavour.

The Ground-nut was cultivated in the Chelsea garden, so long since as 1712.

About Paris it is raised on hot-beds, and transplanted into the open garden, where it ripens its seeds, which are used as other legumes. The pods are sold in most fruiterers shops in London.

The Ground-nut multiplies very fast in hot countries. In England the seeds must be sown on a hot-bed in the spring, and the glasses must be kept over the plants till the middle or end of June; after which, if the weather prove warm, they may be exposed to the open air by degrees. The branches trail upon the ground, and as soon as the flower begins to decay, the germ thrusts itself under ground, and there the pod is formed and ripened.

ARALIA.

Class Pentandria Pentagynia. Nat. Ord. Araliaceæ.

The Characters are—*Involucrum very small; umbel globose; calyx very small, five-toothed; petals five, ovate, oblong,*

spreading or reflexed; stigmas nearly round five-ten; berry roundish, crowned, five, seeded; seeds hard, oblong.

1. *ARALIA SPINOSA* (Angelica-tree Aralia.) Wats. D. B. t. 46. *Arborescent; stem and leaves prickly.*—This rises with a woody stem to the height of eight or ten feet, dividing into several branches, with branching leaves, composed of many divaricated wings, with oblong leaflets; the ribs of the leaves, as also the branches and stem, are armed with strong crooked spines, rendering the places where the plants grow in plenty very difficult to pass through. The flowers are produced in large loose umbels, at the extremities of the branches, and are of an herbaceous colour. The berry is three-cornered and three-celled.

Native of Virginia, whence it was sent to England by Banister, and was cultivated in 1688 by Bishop Compton, at Fulham.

CULTURE.—“This is propagated by seeds, which are easily procured from North America, which should be sown in pots, filled with light earth, and placed in a shady situation till autumn, being careful to weed the pots constantly; otherwise, if weeds are permitted to grow till they are large, they cannot be taken out without drawing up the seeds with their roots. In the autumn, the pots should either be plunged into an old bed of tan, or planted in a warm border, sheltered by a hedge or wall; and, if the winter prove severe, it will be proper to cover the pots with straw or peass-haulm, to prevent the frost from penetrating into the ground. In March the pots should be plunged into a moderate hot-bed, which will bring up the plants early, so that they will have more time to get strength before the following winter. The pots should be constantly kept clear from weeds, and when the plants come up they should be frequently refreshed with water. In May they should be inured to the open air, and when they are removed out of the bed they should have a shady situation. In mild weather these plants should be constantly exposed to the open air; but care must be taken to guard them against frost; therefore the frames under which they ought again to be placed in October, are to be constantly opened when the weather is not severe. In the spring, before the plants begin to push, they

should be carefully shaken out of the pots, and separated; part of them should be planted singly into small pots, and the others may be planted in a bed of light earth in a warm situation. If those which are planted in small pots be placed in a moderate hot-bed, it will greatly forward their growth; but they must be early inured to bear the open air, otherwise they will draw up weak. In the following summer they must have a shady situation, and next winter sheltered again; the spring following they may be shaken out of the pots, and planted where they are designed to remain. Those plants which were planted in the beds will require protection from the frost the first winter; but if the surface of the ground be covered with old tanners' bark, it will prevent the frost from penetrating to the root; and in hard frosts some straw, peass-haulm, or any light covering, will secure their stems from being injured; and after they have remained in the beds two years they will be strong enough to be transplanted in the places where they are intended to grow.

This plant may be also propagated by its roots. If some of the strongest are separated from the plant and left in the ground, they will put out new stems and make new plants. Or if part of the roots are taken off and planted on a moderate hot-bed, they will push out stems in plenty, and may be thus increased with ease.”

2. *ARALIA NUDICAULIS* (naked-stalked Aralia.) Pl. al. t. 238. f. 5. *Stemless; leaves decom-pound; scapes leafless.*—The stem is so very short as to scarcely deserve the name: *leaves* decom-pound, with long petioles; *leaflets* pinnate with five serrate pinnae. A *scape* arises between two leaves, which is trifid, or bears three umbellules. It rises nearly to the same height as the spinosa. The flower stalks spring immediately from the root, and are terminated by round umbels of flowers, in shape and colour like the foregoing; but the berries are smaller. This flowers towards the end of July, and the seeds ripen late in the autumn. The roots were formerly brought over and sold for sarsaparilla, and some of the inhabitants of Canada make use of it as such, but it is very different from the true sort. Native of Virginia and Canada. Linnæus says, there is one very

like it, and perhaps the same, in Java—This and the spinosa were cultivated by Mr. Miller, in 1731.

3. *ARALIA PENTAPHYLLA* (five-leaved prickly Aralia.) *Arboreous, prickly; leaves quinate.*—The branches of this tree are prickly, round, flexuose, smooth, ash-coloured; *prickles* axillary, solitary, horizontal; *leaves* petioled, from one bud to three, four, or more; *leaflets* ovate, acute, serrated at top, unarmed, smooth, the lower ones smaller, the middle one largest; the flowers from buds among the leaves, in simple, peduncled umbels; peduncles half the length of the petioles; pedicels many, capillary, spreading; stamens longer than the corolla. Native of Japan; flowering in May and June. Introduced 1822.

4. *ARALIA RACEMOSA* (berry-bearing Aralia.) Moris. t. 3. f. 9. *Stem herbaceous, smooth; leaves decomposed; peduncles axillary, branched, umbelled.*—This grows three or four feet high, dividing into many irregular branches; *leaves* ramose, alternate; *peduncles* axillary, terminated by round umbels of small four-leaved *flowers*, of a whitish colour; succeeded by round channelled berries, which when ripe are black. It flowers in July, and the seeds ripen in October. Native of Canada; where the berries are eaten, and both leaves and roots are used as salads and pot-herbs by the Indians and French. Flowering from June to October. Introduced 1658.

5. *ARALIA HISPIDA* (hispid Aralia.) Bot. Mag. t. 1085. *Stem suffruticose; and leaf stalks hispid; leaves decomposed.*—A low shrub; *stem*, particularly at the lower part, covered with rigid hairs, more thinly scattered at the upper parts of the branches, and on the foot-stalks, till they disappear in the leaflets. The plant when bruised has a disagreeable smell, and nauseous bitter taste. It flowers in July. Native of North America, in the steep rocky mountains between Canada and Hudson's Bay. Introduced 1799. It is one of those plants which, after being preserved a little while on account of their novelty, having no beauty or other pleasing quality to recommend them, are generally suffered to perish. Those who wish to preserve it should take care to keep it in good dry soil.

ARAUCARIA (see Dombeya).

ARBUTUS (from the Celtic *Are bois* austere bush, in allusion to the roughness of the fruit).

Class Decandria monogynia. Nat. Ord. Ericæa.

The Characters are *calyx* and parted; *corolla* ovate, with a five cleft orifice, *pelluced* at base; *berry* five celled.

1. *ARBUTUS UNEDO* (common strawberry. Eng. Bot. t. 2377. *Stem arborescent; leaves oblong lanceolate; panicle smooth, nodding, berries many seeded.* This beautiful evergreen shrub has long been considered a native of Ireland, although it is not known for a certainty whether it was introduced by the monks of St. Finian. It seems now to be perfectly naturalized in a spot near the Lake of Killarney, where nature seems to have combined the bold and magnificent with the beautiful and picturesque. The foliage of the Arbutus is beautiful, and its flowers are exquisitely delicate. It bears its bright foliage through all seasons, and its flowers of one year, and the fruit of the preceding year, may be seen at the same time.

The common Arbutus or Strawberry-tree rises to the height of twenty or thirty feet, but rarely with an upright stem. It usually puts out branches very near the ground. The leaves keep on all the winter, and are thrust off in the spring by new ones, so that it is always clothed with leaves. The berries have many seeds in them, and are roughened with the tubercles of the seeds.

The Arbutus is now to be found in most of our plantations, and is one of their greatest ornaments in the months of October and November, that being the season when it is in flower, and the fruit of the former year is ripe; for that is a whole year in growing to perfection. When there is plenty both of fruit and flowers upon the trees, they make a handsome appearance, at a season when most others are past their beauty.

Those trees which have large oval fruit, make the greatest figure; the flowers of this being larger and oblong. The variety with double flowers is a curiosity, but the flowers, having only two rows of petals, make no great appearance, nor do the trees produce fruit in any quantity; the other, therefore, is preferable. That with red flowers

makes a pretty variety when intermixed with the other; for the outside of them is of a fine red colour at their first appearance, and afterwards they change to purple before they fall off. The fruit of this is the same with the common one. Besides these principal varieties, the nurserymen have the curled-leaved, or cut-leaved, and the smooth-leaved; they also distinguish the broad from the narrow-leaved.

The country people eat the fruit there, in Spain, Italy, &c. Mr. Ray mentions that he saw it in the market at Padua. It is said to have constituted part of the food of mankind in the early ages:

“*Arbutus fœtes montanaque fraga
legebant.*”

That it was not in any esteem among the ancients we may suppose from the name *Unedo*, if Pliny's reason for that name be the true one: *cui usum ex argumento sit unum tantum edendi*. Virgil recommends the twigs as food for goats in winter:

———“*Jubeo frondentia capris
Arbuta sufficere.*”

“The *Arbutus* is a native of the south of Europe, Greece, Palestine, and many other parts of Asia. It grows on the rocks in Ireland; but is most fruitful on a dry subsoil, and with due shelter from the north; it will also grow well in most places.

The common *Arbutus* may be propagated both by layers and seeds. The best method, however, is from seed.

The seeds ripening at different times must not be gathered all at once. Those fruits which are ripe may easily be known by their turning of a deep brownish tawney colour; examine, therefore, your trees every two or three days. They retain their growing quality a very short time.—Sow the seeds rubbed out with the sand in pots the middle of March. If the quantity you intend to raise be large, prepare a moderate hot-bed of tanners-bark; lay on six inches deep of the finest rich loose mould, sow the seeds, and cover them not more than one-sixth of an inch deep. In five or six weeks the plants will appear.

The second spring, remove them into penny pots, which should be plunged into the hot-bed till August, hardening

them gradually by exposing them to the open air in moist calm weather. Then they may be placed in a warm spot under a hedge, till October, where they may be exposed all the winter, mats only being thrown over them in bad weather. The following spring take out the surface mould, fill the pots again with rich earth, remove them to a shady border till autumn, watering them in dry weather every second or third evening; and then let them stand during winter under a wall or hedge, where they may have the sun.

Having now stood two seasons in the pots, shake them out cautiously, and cut off the mouldy or musty roots; plunge them in water and earth for an hour, and then place them in twopenny pots, where they may continue two or three years; keep them the first season under shade and shelter; water them in dry weather, and every spring take away the earth from the surface of the pots, and replace it with some which is fresh and rich.

They require a generous dry soil, and that they should be planted under the covert of trees at a proper distance.

This tree is not fond of being much pruned at removal; this ought therefore, to be performed a year before or after that operation. It will not succeed in moist, heavy, or clayey lands, but will grow tolerable well in a thin sandy soil; it most affects that which is deep, loamy, and generous. It will rise thirty feet high, in a favourable soil and situation that is well sheltered.

The very best season for transplanting the *Arbutus* is in September, at which time the blossoms are beginning to appear; and at that season, if it should prove very dry, and they are very moist, they will root very soon; but toward the beginning of November, their roots should be well covered with mulch, to keep out the frost.”

2. *ARBUTUS CANARIENSIS* (long-leaved or Teneriffe Strawberry tree). Bot. Mag. t. 1577. *Leaves oblong, lanceolate, serrated; panicle vertical; hips glutinous*.—This species forms a tallish tree growing in the woods in the island of Teneriffe. The colours of the flowers, as in *A. unedo*, varies from greenish-white to red. It flowers in May. Mr. Masson observes that in the Canary Isles, the berries are made into a sweet-meat. Propagated by

cuttings or layers planted in the conservatory.

3. *ARBUTUS HYBRIDA* (hybrid strawberry tree). Bot. Reg. t. 619. *Leaves lanceolate, serrated, very thin, a little cory.*—A very handsome shrub, and pretty common in the nurseries about London. The flowers and foliage are much handsomer than in either *unedo* or *Adrachne*. It has the deciduous fork of the latter, and the nearly useless germen of the former. The bloom is ornamental, and smells like honey.

4. *ARBUTUS ANDRACHNE* (oriental strawberry tree). Bot. Reg. t. 113. *Bark deciduous excent; leaves ovate, entire, or serrated pannicle, pubescent, erect; bractes many seeded; ovary smooth.*—A handsome evergreen shrub, growing sometimes near eight feet high, with a stem three inches in diameter. The bark quite smooth, and in the winter of a fine red colour, in the spring the epidermis peels off spontaneously. The berries which do not ripen are round, like those of the *A. unedo*, and about the size of a raspberry; the germen, however, is pubescent, which is not the case in *unedo*. The branches are irregular. It survives our common winters in the open air, when the plant becomes woody; but should be raised under cover, where it must remain at least four or five years before it is planted in the open border; and then ought to be placed in a warm sheltered position, and dry soil. It grows naturally in the east; particularly about Magnesia, where it is so plentiful as to be the principal fuel used by the inhabitants. M. Marschall Von Bielberstein found it growing on the sides of rocks about most of the maritime villages of the Crimea, where it varies with a somewhat villous subserrate foliage, and is one that is perfectly smooth and entire, and is called by the inhabitants "*Jaban Dephus*," or wild baytree. Flowers in March and April. Cultivated by Dr. Sherrard in 1724.

5. *ARBUTUS LAURIFOLIA* (laurel leaved Strawberry-tree). *Stem arborescent; leaves oblong, acuminate to both ends, sharply, serrate. smooth; racemes axillary, ranked, sessile, solitary.*

This is very like the common *Arbutus*, but differs in its sharp cuspidate serratures, and its axillary, very simple racemes, shorter than the leaves, with

the flowers all directed the same way. It is a native of North America.

The cultivation of the *species of this genus* is effected most commonly by seed; they will, however, sometimes grow by layers and cuttings, though in the latter mode rather more reluctantly, but the seed grows freely, from which the handsomest plants are frequently obtained. To continue the double-blossomed and scarlet kinds with certainty, it must be done either by layers, cuttings, grafting, or inarching, for these varieties will not retain their difference if continued from seeds.

To propagate them by layers, the young shoots must be employed, otherwise they rarely emit roots in less than two years. Cuttings will send out roots by the aid of heat. In this view plant a number of the short young shoots in pots in spring and summer, and plunge them into a hot-bed of tan and dung.

ARBOURS (*Arboreta*, of *Arbor. Lat.* a tree). These were formerly in greater esteem with us than at present; few gardens were without covered arbours, and shady seats; but of late they have been much rejected, and that not without good reason; for besides the great expense of their first erecting, they were a continual charge keeping repaired; for the wet soaking through the leaves of the trees to the wood work was, by the continual shade, and for the want of free air, detained so long as to rot the wood (which, if wholly exposed to the weather, would have lasted seven or eight) in two or three years; beside the seats are continually damp and unhealthy: for which reason, covered seats or alcoves, are everywhere at this time, preferred to them.

Arbours are generally made of lattice work, either in wood or iron, and covered with elms, limes, hornbeam, or with creepers, as honeysuckles, jasmines, or passion-flowers; either of which will answer the purpose very well if rightly managed.

ARCHANGELICA.

Class Pentandria Digynia. Nat. Ord. *Umbellifera*.

The Characters are—*General involucre often wanting; fruit sub-compressed, three-ribbed; ribs acute, winged; petals uniform, incurved, entire.*

ARCHANGELICA OFFICINALIS (garden archangelica.) Eng. Bot. t. 2561.—

Leaves bi-pinnated, with the terminal leaflet three-lobed.—Angelica is either a native of this country or completely naturalized, being found growing naturally at Broadmoore, about seven miles north-west from Birmingham, and in the marshes among reeds, by the side of the Thames, between Woolwich and Plumstead, and in some other places; flowering from June to September.

The root is large, fleshy, branched, resinous, brown externally and white within. The stem is erect, four or five feet high, jointed, round, hollow, striated, smooth, of a purplish hue, or somewhat glaucous at the lower part, and sends off numerous branches which terminate in large globular many-rayed umbels. The foliage, stalks, and even the flowers, are all of a bright green. The leaves are numerous, very large petiolated, smooth, and pinnated, with the leaflets ovate-lanceolate, pointed, cleft, acutely serrated, smooth, and having the terminal ones three-lobed; the foot-stalks membranous at the base, tumid, with many ribs, and very much dilated. The general bractees or involucre are few, linear, deciduous, often wanting; the partial ones, consisting of about eight linear-lanceolate leaves, occasionally enlarged, leafy, and notched. The flowers are numerous, of a greenish white colour, and grow in large terminal umbels, composed of several partial ones, both of which are nearly globose and many-rayed. There is no calyx; the corolla is small, and divided into five equal, lanceolate, petals, with the points notched and turned inward; the stamens thread-shaped, spreading, longer than the corolla, with roundish anthers; the germen is inferior, ovate, furrowed, supporting two very short, erect, and subsequently recurved styles, with obtuse stigmas. The fruit is a sort of capsule, large, flat on one side, convex on the other, with three acute ribs, emarginate at both ends, divisible into two parts, containing a single brown, ovate, pointed seed.

Bohemia and Spain are said to produce the best Archangelica. The college formerly ordered the Spanish only to be kept in the shops. Linnæus, however, avers that the plant is most vigorous on its native northern mountains, and gives a decided preference to the root dug here, either early in the spring

or late in autumn. This plant and the *Acorus Calamus*, are almost the only aromatics of European growth; the former is decidedly more pleasant, and is very undeservedly neglected in modern practice.

The roots are the part used, and possess a fragrant agreeable smell, and a bitterish pungent taste; on being chewed they are first sweetish, afterwards acrid, and leave a glowing heat in the mouth, and fauces, which continues for some time. The stalks, leaves, and seeds, possess the same qualities in a lesser degree. Dr. Lewis says, that on wounding the fresh root early in the spring, it yields from the inner part of the bark an unctuous, yellowish, odorous juice, which, gently excicated, retains its fragrance, and proves an elegant, aromatic, gummy resin. Rectified spirit extracts the whole of the virtues of the root; water but very little; and by distillation in the latter a small portion of very pungent oil is obtained. Cows, goats, and swine eat it, but horses refuse it.

The Laplanders extol it not only as food, but as a medicine. For coughs, hoarseness and other pectoral disorders, they eat the stalks roasted in hot ashes; they also boil the tender flowers in milk, till it attains the consistence of extract, which they use to promote perspiration in catarrhal fevers, and to strengthen the stomach in diarrhoea. The leaves, seeds, and root are certainly good aromatic tonics, and may be given three or four times a day, in doses of two scruples to a drachm. An agreeable sweetmeat is made of the root by the confectioners of London, which is only surpassed by that of ginger.

The following passage from old Gerard, if not instructive, is at least exceedingly entertaining:

"The rootes of Garden Angelica is a singular remedy against poison, and against the plague, and all infectious taken by euill and corrupt aire, if you do but take a peece of the roote and holde it in your mouth, or chew the same betwene your teeth it doth most certainly driue away the pestilentiall aire, yea, although that corrupt aire have possessed the heart, yet it driveth it out again by vrine and sweate, as rice and treacle doth, and such like *Antipharmaca*. Angelica is an enimie

to poisons: it cureth pestilential diseases if it be vsed in season: a dram waight of the powder hereof is given with thin wine, or, if a feauer be vehement, with the distilled water of *Carduus benedictus* or of *Tormentill*, and with a little vineger, and by it selfe also, with treacle of vipers added. It openeth the liuer and spleen, draweth downe the tearmes, driueth out or expelleth the secondine. The decoction of the roote made in wine is good against the cold shiuering of agues. It is reported that the roote is auailable against witchcraft and inchantments, if a man carrie the same about him, as Fuchsius saith. It extenuateth and make thinne grosse and tough flegme; the root being vsed greene, and while it is full of iuice, helpeth them that is asthmatake, dissolving and expectorating the stuffings therein, by cutting off and cleansing the parts affected, reducing the bodie to health againe; but when it is dry it worketh not so effectually. It is a most singular medicine against surfeiting and loathsomnes to meate: it helpeth concoction in the stomacke, and is right beneficial to the hart: it cureth the bitings of mad dogs, and all other venomous beasts. The wild kinds are not in such force in working, albeit they haue the same vertues attributed vnto them."

It delights in moist situations on the banks of running water, but will grow freely in any soil and exposure. The plants are raised from seed; and, for a bed four feet and a half by six feet, sown in drills a foot apart, to be transplanted, half an ounce of seed will be requisite. "Sow in August, or as soon as the seed is ripe, as the plants will come up earlier and stronger than from a sowing in the spring. When the plants are advanced from four to six inches high, transplant them into rows two feet apart. They will soon strike root, and advance quickly into strong growth. In the second year their strong erect branchy stalks will be several feet high, producing large umbels of seed, ripening in autumn, which as well as the leaves of the plant, are used in medicine. But, for candying, the young shoots of the stems, and stalks of the leaves are the useful parts; being cut, while green and tender, in May and June, they are made by confectioners into the sweetmeat called Angelica.

In the second year, if seed is not wanted, cut the plants down in May, and the stool will send out side shoots; by repeating this practice every year, the same plant may be long continued. Cuttings will also grow."

ARCTIUM (*arth*, Celtic; on account of the rough bristly fruit, which may be compared to the coarse hair of a bear).

Class Syngenesia Polygamia Æqualis. Nat. Ord. *Compositæ*.

The Characters are—*Involucre globose, each of its scales with an incurved hook at the extremity; receptacles chafsy; pappus simple*.

1. **ARCTIUM LAPPA** (smooth-headed burdock.) Eng. bot. t. 1228. *Leaves cordate, petiolate*.—Burdock is very common by road sides, on rubbish, and on ditch banks throughout Europe, varying much according to the luxuriancy of the soil, and thriving particularly on dunghills, and flowering in July and August. The calyx is globular, formed of numerous narrow scales, each tipped with a little incurved hook, by means of which the whole calyx, when laden with ripe seed, easily separating from its stalk, adheres to the hairy or woolly coats of animals, who can scarcely free themselves from this incumbrance without rubbing the calyx to pieces, and so scattering the seed about their habitations, where it is most likely to meet with a manured soil. It is no less common in Japan, where it is called *Gobo* and *Uma Bufuki*. In England it is commonly known by the name of *Burr*, either simply, or, with some prefix, as *Great-burr*, *Clot-burr*, and *Hurr-burr*; the usual name in books is *Burdock*. In German it is called *Gemeine Klette*; in Dutch, *Gemeene Kluisson*; in Danish *Agerburre*; in Swedish, *Karburre*; in French, *Bardane* or *Glysteron*; in Italian *Lappolo* or *Bardana*; in Spanish, *Lampazo* or *Bardana*; in Portuguese, *Lappa*, *Arcio*, or *Pegamaca*; in Russian *Lapuschnik* or *Repeinik*.

Few quadrupeds, except the ass, touch this plant with us. According to Linnæus, cows and goats only eat it; and Dr. Stokes adds, "That a horse eats the leaves and even the heads. Birds feed on the seeds; and snails, slugs, and some caterpillars on the leaves. Boys catch bats by throwing the prickly heads up into the air. The stems, stripped of their rind, before the flowers appear, are eatable, either boiled

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or raw, with oil and vinegar." A decoction of the roots is esteemed by some very sensible physicians as equal, if not superior, to that of Sarsaparilla. Two ounces of the dried root are boiled in three pints of water till one pint is wasted, and a pint or more of the strained liquor taken warm every day.

The herb being burnt green, between the time of flowering and seeding, in a hole made in the ground, without suffering the flame to escape, three pounds of the ashes produced sixteen ounces of very white alkaline salt, as good as the best pot-ash.

There are many varieties of this common plant, differing in colour, and the size and smoothness, or woolliness, of the heads. The most remarkable of these is the *Woolly-headed Burdock*, which Mr. Miller has figured in his plates, and which he looks upon as a distinct sort, because the leaves are whiter beneath, the heads more compact, and the florets of a bright red colour; but principally because the calyx is beautifully netted with a fine down all over.

2. *ARCTIUM BARDANA* (woolly-headed Burdock.) Eng. bot. t. 2478. *Cauline leaves cordate, stalked, entire; involucre cobwebbed, downy.*—The fine cobweb down entangled amongst its calyx scales distinguishes it from *A. lappa*. It is a very common plant, as well as the other, by way-sides and amongst rubbish. Ray distinguishes several varieties of each of these species.

3. *ARCTIUM MINUS* (small Burdock.) Schk. bot. tab. 227. *Involucre woolly; inner scales subulate, somewhat coloured; scarcely longer than outer: racemes axillary panicled.*—A native of Europe. Flowering in July and August.

These plants may readily be increased from seed, but are seldom admitted into any but botanic gardens. The first sort is much propagated by sheep carrying about the hooked seeds in their fleeces, and probably also by small birds. Where it is a troublesome weed, it may be destroyed with less trouble than such plants as have perennial roots; and if cut up before it seeds, in two or three years it may be entirely rooted out; for the plants which come up from seed do not flower till the second year, and when the seeds are perfected their roots decay.

ARCTOPUS (literally bear's foot.)

Class Polygamia Diœcia. Nat. Ord. *Umbelliferae*.

The Characters are—*MALE, an umbel:—petals and stamens 5.—HERMAPRODITE, an umbel—petals 5; styles 2; seeds 2; involucre very large.*

ARCTOPUS ECHINATUS (rough arctopus.) Bot. reg. 605. *Leaves prickly, with stellate spines.*—A handsome plant from the Cape of Good Hope. It has the habit of *Eryngo*. The leaves are crowded, sinuate and ciliate, with spines on the upper surface disposed starwise at the sinuses; flowers terminating among the leaves.

This singular little species is the sole member of its genus; it appears to have excited peculiar interest in Professor Thunberg, who has recorded it in his Cape Flora by an elaborate detail.

The plant in its native place, where it is very common, is said to be in repute for certain medicinal virtues. It flowers from June to September. Introduced in 1774 by Mr. Masson, but does not appear to have flowered in this country until 1823.

ARCTOSTAPHYLOS.

Class Decandria Monogynia. Nat. Ord. *Ericææ*.

The Characters are—*calyx five-cleft; corolla ovate, its orifice five-cleft, its base transparent; berry superior five-celled; antheræ with two pores.*

1. *ARCTOSTAPHYLOS UVA URSI* (berry-bearing *Arctostaphylos*). Eng. Bot. t. 714. under *Arbutus uva ursi*. *Stems procumbent; leaves entire.*—This pretty evergreen shrub is met with both in the old and new continents; for, in the northern parts of Europe, it abounds in Sweden, Lapland, and Iceland; is extensively diffused over Scotland and the north of England, and extends southwardly to the Mediterranean. It is also found in Siberia, and is represented as abundant on the banks of the Wolga: while in North America it grows from Hudson's Bay, as far south as the central parts of the United States.

With us, it occurs only in dry, stony subalpine moors, covering the ground with beds of considerable extent, at the height of 1,500 feet and upwards above the level of the sea. It is common throughout the Highlands, and islands of Scotland, and abounds at Dunkeld and Blair, the seats of the Duke of Athol, in Perthshire. It is the plant mentioned in Ray's Synopsis, p. 458.

as found by Mr. Lhwyd, growing plentifully in the isle of Mull, at the end next Y-Columb-kill, for the space of several miles. It was perceived many years ago by Lightfoot, at the top of East Common Wood, about a mile from Hexam, in Northumberland: and is said by Mr. Winch to flourish on Cronkley Fell, and Blanchland in the same county, at an elevation of from 200 to 2,000 feet.

The *root* is perennial, long, and fibrous; sending off several round, woody, branched, spreading, procumbent *stems*, covered with a smooth deciduous bark. The *leaves* are not unlike those of the box, alternate, evergreen, obtuse, obovate, entire, attached by short *stalks*, coriaceous, smooth, convex, dark green, and wrinkled above; concave, finely reticulated and paler beneath, with the margin rounded, and in the young ones pubescent. The *flowers*, which are produced in June, grow in small clusters at the extremities of the branches, each supported on a short red footstalk, and furnished with many acute coloured bractæas. They are usually five or six on each branch, drooping, and of a pale rose-red colour. The *calyx* is small, obtusely five-toothed, and persistent. The *corolla* is ovate, smooth, transparent at the base, contracted at the mouth, with five short reflexed segments. The *filaments* are awl-shaped, downy, inserted at the base of the corolla, and crowned with reddish incumbent *anthers*, of two oval cells, opening by two terminal pores, and bearing a pair of short horns or spurs. The *germen* is roundish, bearing a cylindrical erect style, the length of the corolla, with a simple stigma. The *fruit* is a small, globular, smooth, depressed scarlet berry, containing a mealy pulp of an austere taste, and four or five angular seeds.

The plants of this genus are very nearly allied to those of the *Vaccinium*, or Wortle-berry, from which they differ principally in the situation of the berry, which in the *Arctostaphylos* grows above the calyx; and in the *Vaccinium* below it. The present species may be distinguished from the *alpina*, or Black Bear-berry, by the figure of the leaves, which in the former are smooth, and entire, while in the latter they are rugged, and serrated.

The leaves of this plant, about the

middle of the last century, acquired great celebrity, not only for their efficacy in gravelly complaints, but in almost every other to which the urinary organs are liable, as ulcers of the kidneys and bladders, diabetes, &c. Among the numerous physicians who extolled the virtues of *uva ursi* in calculous complaints, De Haen may be considered the principal, and upon his authority it has been much used in this country; but in no instance does it appear to have produced that essential or permanent relief which is said to have been experienced by the German physicians. The leaves of this plant are powerfully astringent, and the advantages they have occasionally afforded in gravelly pains is now wholly ascribed to this quality. Perhaps upon the whole, we shall find it no better than other vegetable astringents; some of which have long been used by the country people, in gravelly complaints, and with very great advantage; though hitherto unnoticed by our regular practitioners.

But whatever may be the event of its medical qualities, the whole plant is certainly very serviceable in dyeing an ash-colour, but particularly in tanning leather. In this view it may deserve attention, in those countries where whole mountains are covered with this trailing shrub, and they have scarcely timber sufficient for their economical purposes. The berries are a food for grouse and other game. It may be increased by seeds, or by inarching.

2. *ARCTOSTAPHYLOS ALPINA* (Alpine *Arctostaphylos*). Eng. bot. t. 2030. *Stems procumbent; leaves rugose, serrated*.—The woody trailing stems spread widely, clothed with deciduous bark; leaves alternate deciduous; flowers in short terminal clusters, white. Each flower stalk has an elegant, concave, reddish, fringed bractæa at its base. The berries are round and black, like black currants, and resembling them also in flavour. A native of Scotland, between two high mountains, in a valley covered with common heath near the head of Loch Traig, Perthshire.

ARCTOTHECA.

Class Syngenesia frustranæ. Nat. Ord. *Compositæ*.

The Characters are *receptacle favose; pappus 0; involucre imbricated*.

ARCTOTHECA REPENS (Creeping *Arctotheca*). Jacq. schoen. 3, t. 306. *Florets of the ray sterile; receptacle paleaceous; scape one-flowered; leaves pinnatifid.*—An ornamental plant, a native of the Cape of Good Hope. The roots are perennial, creeping extensively; stems herbaceous, prostrate, branched, clothed like the backs of the lyrate pinnatifid leaves, with white cottony down; flower stalks radical, several together, simple, erect, naked, about six inches high, being rather longer than the leaves. The flowers, which are produced in July and August, are solitary, an inch and a half broad, and of a lemon-colour, with purple ribs beneath. It grows freely in an equal mixture of loam and peat, and is increased by cuttings, which root readily under a handglass, in the open air. Introduced 1793.

ARCTOTIS.

Class Syngenesia Polygamia Necessaria. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle setose, alveolate; pericarps half two celled, or two furrowed at the back; pappus paleaceous; involucre imbricated, with scales, scarious at end.*

1. **ARCTOTIS ACAULIS** (dwarf *Arctotis*). Bot. reg. t. 122. *Radiant florets fertile; stem very short, decumbent; leaves hoary on each side, ternate, lyrate.* A small greenhouse plant, the flower stem rarely exceeding six inches in height; but the flowers, which are yellow, are large and fine, exceeding two inches in diameter; rolling outwards as it decays, disk nearly black. They come out in April and continue to July. Propagated by dividing the root. Introduced 1753.

2. **ARCTOTIS TRICOLOR** (three coloured *Arctotis*). Bot. reg. t. 131. *Leaves downy beneath, ovate, entire, or lyrate toothed; scape furrowed, one headed.*—In this species the leaves are several, all radical; scapes from six inches to a foot high, one-flowered. Flowers nearly three inches across; ray white on the inside, with a purple black base; on the outside deep purplish. The disk is uniformly of a deep shining blackish brown, previous to the complete expansion of the florets; when it becomes of a dusky opaque green; flowers from May to July, and requires the shelter of a greenhouse.

Easily propagated by suckers, plant-

ed in a mixture of peat earth and hazel-loam. Introduced 1794.

3. **ARCTOTIS GRANDIFLORA** (great flowered *Arctotis*). *Leaves pinnatifid, toothletted, cobwebbed, three-nerved.*—The ray is very large. Petals straw coloured, with a tinge of red underneath, yellowish above near the base, with a very dark purple mouth. It is biennial, flowering from March to May. Introduced 1774.

4. **ARCTOTIS SPECIOSA** (showy *Arctotis*). Bot. Mag. t. 2182. *Stemless; leaves lyrate, pinnatifid, hoary beneath, five-nerved; outer scales of involucre linear, recurved.*—The root is perennial or biennial. *Leaves* all radical: some quite entire, others lyrate-pinnatifid, crenate, dentate; terminal lobe tripinnatifid, rough, and tomentose on the upper, and hoary on the under side. *Scapes* several, rounded, streaked, hispid with purplish hairs. *Bracts* one or two, distant, subulate, deciduous. *Calyx* imbricate; *inner scales* largest, smooth, scarios; *external ones* linear, hairy and recurved. *Florets of the ray* long, minutely three toothed, four nerved, orange coloured on the inner side, with a black purple spot at the base, and streaked with purplish red on the outer. *Florets of the disk of a black purple colour, relieved by the golden pollen.* *Receptacle* honey-combed bristly; *germens* bristly at the base, and crowned with a chaffy pappus.

The scapes rather longer than the leaves. It is very like *grandiflora* of the Kew catalogue, but not caulescent.

A native of the Cape of Good Hope. Requires to be protected from frost. Flowers from July to September. Introduced 1812.

5. **ARCTOTIS ARGENTEA** (silver-leaved *Arctotis*). *Leaves lanceolate, linear, entire, downy.*—The flowers are yellow, showing themselves in August. Introduced 1768.

6. **ARCTOTIS ANGUSTIFOLIA** (narrow leaved *Arctotis*). *Stem branched ascending; leaves spatulate, lanceolate, five-nerved, pubescent.*—*Florets of the disk barren.* *Receptacle* very woolly. Flowers from June to September. Introduced 1739.

7. **ARCTOTIS MACULATA** (spotted *Arctotis*). Bot. reg. t. 130. *Leaves pinnatifid, lyrate, angular, toothed, downy beneath.*—This handsome flower has

been long in our collections. The stem is upright, seldom exceeding two feet and a half high with its inflorescence, coated over by a white short down like frosted silver. The ray is more than two inches across, of a light cream coloured white on the inside, suffused at the points and back with a tawny yellow hue, at the inner base, above the short tubes of the florets, of a blackish purple colour.

A hardy greenhouse plant, easily increased by cuttings planted out in the open ground; requires a considerable share of water in the summer months, during which it contrives to produce a succession of bloom.

8. *ARCTOTIS ASPERA* (broad rough leaved *Arctotis*). Bot. reg. t. 34. *Stem erect; leaves pinnatifid; scabrous, downy beneath, revolute at edge.*—The stem is stiff, perennial, villous with purple streaks. Corollas of the ray yellow, with red streaks beneath, fertile; those of the disk barren. The flowers have a slightly bitter smell. The style, by the expansion and contraction of which the stigma is made to advance and withdraw, seems to consist of a substance resembling *caoutchouc*; and may be repeatedly drawn out to a considerable extent like that, contracting to its former dimensions when left to itself with the same elastic force. Introduced 1710.

9. *ARCTOTIS AUREOLA* (narrow rough-leaved *Arctotis*). Bot. reg. t. 32. *Outer scales of involucre reflexed, cuneate, oblong, with a broad, short point, somewhat cobwebbed.*—This species become shrubby as well as *Aspera* (which it greatly resembles) acquiring by age a hard-wooded close-fibred stem of nearly an inch and a half in diameter. They require to be frequently renewed by cuttings, which strike easily if planted in a border of light earth during any of the summer months. These, when properly rooted, may be potted in the Autumn, in order to be sheltered for the winter in the greenhouse or garden frame. In summer they can scarcely be supplied with too much water, if properly drained. Old plants are apt to become mouldy, and should be frequently cleared of their decayed leaves.

Both species are very desirable acquisitions for the greenhouse, since, besides the beauty of the bloom, easy culture and propagation, they afford a suc-

cession of flowers nearly the year round. Introduced 1710.

10. *ARCTOTIS UNDULATA* (waved leaved *Arctotis*). Jacq. schæ. t. 160. *Radiant florets fertile; leaves downy beneath, wavy toothed, ovate or lyrate; scapes one headed.*—The flowers are scentless, three inches in diameter, and of an orange colour; they are produced from April to June. A native of the Cape. Introduced 1795.

11. *ARCTOTIS ROSEA* (rose *Arctotis*). Jacq. schæ. t. 162. *Radiant florets fertile; stem procumbent; leaves spatulate, lanceolate, repand toothed, hoary.*—One of the most showy of this elegant genus, producing a succession of its beautiful flowers from July to September; they generally measure more than two inches in diameter. A native of the Cape. Introduced 1793.

12. *ARCTOTIS SPINULOSA* (thorny leaved *Arctotis*). Jacq. sc. t. 167. *Stem erect; leaves hoary, viscid, oblong, amplexicaul, mucronate-toothed.*—The whole plant possesses a pleasant smell. The root is annual. Stem a foot and a half high, much branched; peduncles terminal, one flowered; radiant florets fertile; the flowers which are orange coloured, black at the base; are produced from May to August in great profusion, and are very ornamental. Introduced 1795.

13. *ARCTOTIS ARBORESCENS* (arborescent *Arctotis*). Jacq. sc. t. 171. *Stem erect; peduncles hairy; leaves pinnatifid, hoary, downy beneath, segments lanceolate, angular toothed.*—The stems are from two to three feet in height; leaves four to six inches long, peduncles terminal, one flowered; flowers white with dark purple at the base; of a pale pink on the outside. Blooms from June to August. Introduced 1818.

14. *ARCTOTIS GLAUCOPHYLLA* (sea-green leaved *Arctotis*). Jacq. schæ. t. 170. *Leaves hoary, repand, pinnatifid, somewhat toothed, outer scales of involucre reflexed.*—The root is fusiform, stem a foot in height, leaves two to six inches long; peduncles terminal, erect, one-flowered. Flowers orange coloured, dark purple at the base. They are produced from June to August. The whole plant has an unpleasant smell. Introduced 1794.

15. *ARCTOTIS FLACCIDA* (bending stalked *Arctotis*). Jacq. sc. t. 163. *Stem branched ascending; leaves spatulate,*

lanceolate, entire, three nerved, downy.—The whole plant possesses a nauseous and fetid odour. The root is annual. Leaves pale green. Peduncles terminal. one flowered. Flowers cream coloured, yellow at the base, and tinged with pink on the outside. Blooms from May to August. Introduced 1794.

16. *ARCTOTIS DECURRENS* (decurrent *Arctotis*). Jacq. sc. t. 165. *Stem shrubby; leaves hairy, oblong, undivided, somewhat toothed.*—The stem is from two to three feet high, much branched. Leaves alternate from two to seven inches long. The flowers which are from two to five inches in diameter are showy, they are white, with the base of a dark purple; florets of the ray yellow. Flowers in June and July. Introduced 1794.

17. *ARCTOTIS REPTANS* (creeping *Arctotis*). Jacq. sc. t. 382. *Stem ascending; leaves hairy, hoary beneath, lower lyrate-toothed.*—An ornamental species producing its pretty flowers from June to September. The root is creeping, the stems are numerous, a foot and half high. Leaves alternate, three to four inches long. Peduncles erect, terminal, one-flowered. The flowers are cream coloured, marked behind with purple stripes. Introduced 1795.

18. *ARCTOTIS DECUMBENS* (decumbent *Arctotis*). Jacq. schœn. t. 381. *Stem procumbent; leaves oblong, lanceolate, unequally toothed, hoary, downy beneath, three-nerved.*—Stem a foot and a half high, purplish; leaves four inches long; flowers from two to three inches in diameter. Introduced 1790.

CULTURE.—These plants are all natives of the Cape of Good Hope. The annual sorts may be raised from seeds sown in the spring, either in a warm border of light earth, about the middle of April, or in a moderate hot-bed towards the end of March. In favourable seasons the former will be the strongest plants, but in cold seasons they will seldom ripen their seeds. The latter must be transplanted, when they are fit, into pots; and as soon as they are well-rooted, inured gently to the open air; they require much water in dry weather: they may also be propagated by cuttings or slips from the roots. The shrubby sorts are propagated by planting cuttings in a bed of light fresh earth in one of the summer months, observing to shade them from the heat

of the sun, until they have taken root, and also to frequently refresh them with water. In six weeks after planting they will be rooted sufficiently to be transplanted into pots, when they are to be placed in a shady situation until the plants are new rooted; after which they may be exposed to the open air, till the latter end of October (or later, according to the state of the weather), when they must be removed into the greenhouse.

While they continue in the house they ought to have a open and dry situation, and be frequently supplied with water. They will also require to be shifted into other pots, two or three times every summer; and the pots should be often removed to prevent the plants from striking their roots through the holes into the ground; several of these grow to the height of four or five feet, and as they send off several branches, they require to be frequently pruned. They are seldom without flowers, unless the winter be very severe, which renders them extremely valuable, making a fine variety in the greenhouse or cape stove; and when placed out in summer, they produce flowers in great abundance.

ARCTUATION (from *arcuo*, *Lat.* to bend or bow like an arch); the method of raising trees by layers.

The first thing that is to be done is to procure strong mother plants, which are usually called stools. It is no matter whether the trees be crooked or otherwise deformed. They are to be planted in a border six feet wide, and in a straight line six feet asunder.

The border must be well trenched or dug, and cleared from all roots, clods, stones, or any other obstructions. These trunks or stools, being planted in this trench, will throw out a great many shoots according to their strength, which may be laid about the Michaelmas following: in order to this, the ground round each stool should be carefully dug, breaking the clods and picking out the stones as before. Then the shoots should be bent down in arches, and put into the ground about three inches deep; and to keep them in this situation, each should have a forked stick drove into the ground over the part of the shoot immersed, turning the extremity of each shoot upward.

When the branches are thus laid

round the stool, and pegged fast down, the branches, or shoots, will be covered all over, except the very top. Some persons give the branches a twist, in order to make them take root the sooner. Others slit such of the roots as are not apt to take root without, in the same manner as is practised in laying of Carnations, which is generally a sure way; and if they are afterwards mulched, it will be of use to keep out the frost in winter, and also to keep the ground moist the following spring and summer.

About the end of September following they may be opened and examined, to see if they have taken root or not, which it is very probable they will have done; but, if not, they must be let alone, to lie till the next autumn, when they are to be taken up, and planted in the nursery.

This may be done to the Dutch, Witch, and English Elms; the Abele, Lime, Alder, Platanus, and many sorts of evergreen trees and flowering shrubs.

ARDISIA.

Class Pentandria Monogynia. Nat. Ord. *Myrsineæ* Brown.

The Characters are—*calyx 5, parted; corolla hypocrateriform, with a reflexed limb; anthers large, erect; stigma simple; drupe fleshy, superior; one-seeded.*

1. *ARDISIA ACUMINATA* (acuminated Ardisia). Bot. mag. t. 1768. *Panicles axillary and terminal; leaves oblong, acuminate, narrowed at base.*—A shrub a foot and a half or two feet high, with green smooth bark; branches alternate, spreading; leaves ribbed with numerous parallel veins, uniting near the margin; peduncles axillary, not half the length of the leaf; bearing simple or compound corymbs of flowers; calyx 5 parted, white, with rust-coloured dots; corolla saucer-shaped; limb 5-cleft, plain white, with rusty yellow dots, scarcely visible to the naked eye; germen globular. Native of Guiana; flowering in July. Introduced 1803.

2. *ARDISIA TINIFOLIA* (tinus-leaved Ardisia). Sloan. jam. 2. 98, t. 205, f. 2. *Flowers panicled; leaves elliptic entire neared; stem arborescous.*—This tree rises to about thirty feet high, having an ash-coloured smoothish bark; leaves very smooth, dark green, four inches long, and two broad in the middle, with a prominent midrib. Petioles a quarter

of an inch in length. Flowers purplish, bowed back. Native of Jamaica.

3. *ARDISIA SOLANACEA* (nightshade-like Ardisia). Bot. mag. 1677. *Corymbs axillary, 3-parted; leaves oblong, narrowed towards each.*—In this fine shrub the corolla has a singular appearance, much like an artificial flower made of shells. The corymbs are rarely tripartite. The buds are all cernuous, but as the flower expands the pedicels become straight, one open flower only appearing at a time in each corymb.

The juice of the berries, according to Roxburgh, is of a very beautiful bright red colour, which, upon paper, changes to a durable brown.

Native of the coast of Coromandel; growing in moist places, in the valleys among the mountains. Called by the Telingas, *Conda Mayoer*. It flowers from June to September. Intro. 1708.

4. *ARDISIA PANICULATA* (panicled Ardisia). Bot. reg. 638.—*Leaves wedge-shaped, oblong, nearly sessile, entire, smooth, reflexed, panicles decompound.*—This species of Ardisia is probably the finest of the whole genus, growing into a small tree, with large reflexed foliage, and bearing oval-shaped panicles of rose-coloured flowers at the extremities of the branches. These remain a long time in bud, and are probably more beautiful in that state than when the flowers are fully expanded, the bud being of a deeper colour than the flower. Like most of the genus it continues covered with blossom and fruit, at the same time, for a great part of the year.

It is a native of Chittigong, in the East Indies. Requires to be kept constantly in the stove.

5. *ARDISIA COLORATA* (red-flowered Ardisia). Bot. cab. 405. *Leaves oblong, entire, coriaceous, shining; panicles terminal; sepals round; corolla twice as long as calyx.*—It is an elegant plant, with very fine laurel leaves, which are flatter, larger, and more glossy than those of *A. solanacea*. The flowers come out plentifully in clusters from the axils of the leaves; they open two or three at a time, and continue successively for several months in the spring and summer.

It may be increased by cuttings or seeds, and should have a rich loamy soil, and kept in the hot-house.

6. *ARDISIA UMBELLATA* (umbel-flow-

ered *Ardisia*). Bot. cab. t. 531. *Leaves glossy*.—This is a handsome stove plant, flowering freely in the summer months. It may be increased by cuttings, and should be potted in a mixture of loam and peat. A native of Sumatra. Introduced 1818.

7. *ARDISIA ELEGANS* (elegant *Ardisia*). Bot. cab. t. 264. *Leaves oblong, entire, coriaceous, shining; panicle terminal; sepals rounded; corolla thrice as long as calyx*.—This species is a very pretty stove plant; the flowers are produced at different seasons; they come out of the ends of the side shoots. The plant does not grow very large, rarely exceeding two feet in height, and flowering when quite young. In the summer it may be put out of doors in a sheltered situation, for two months, which will conduce much to its health and vigour.

It may be increased with some difficulty by cuttings, planted in loam and peat. A native of the East Indies. Introduced 1805.

8. *ARDISIA PUNCTATA* (dotted *Ardisia*). Bot. reg. 827. *Leaves lanceolate, coriaceous, sinuate, narrowed towards the base; corolla campanulate, dotted; lobes obtuse*.—A handsome addition to the conservatory, easily distinguished by its long leaves, which are not crenulate, but merely sinuated at the edges, with slight contractions at the margin, at intervals resembling denticulations, by its drooping whitish grey flowers being densely covered with dark dots of a dull purple colour, and by the obtuseness of the lobes of the corolla, which is distinctly bell-shaped, not spreading open or reflexed. A native of China; easily cultivated, and propagated by cuttings. Flowers from June to August. Introduced 1823.

9. *ARDISIA PYRAMIDALIS* (pyramidal *Ardisia*). Bot. cab. 448. *Raceme terminal, pyramidal; peduncles alternate, umbelliferous; leaves, oblong obtuse, smooth, entire*.—Like most of the genus it has fine glossy leaves, and produces its blossoms in great abundance during the months of July and August. It requires the constant protection of the hot-house, and may with difficulty be increased by cuttings or layers, potted in a mixture of loam and peat. A native of Santa Cruz. Introduced 1818.

10. *ARDISIA CRENULATA* (crenulated *Ardisia*). Bot. reg. t. 633. *Panicles*

terminal; leaves lanceolate, ovate, repand, crenate, acuminate, attenuated at base. It is a neat little shrub, producing flowers and fruit nearly the whole year round. We have plants not above three inches high quite loaded. The berries are by no means unpleasant to the taste. In some of the species they are said to be esteemed for their cooling and refreshing qualities. It requires the protection of the greenhouse, and is increased both by seeds and cuttings; soil, a mixture of loam and peat.

11. *ARDISIA CANALICULATA* (channelled *Ardisia*). Bot. cab. t. 1803. *Leaves oval; petioles, their upper surface remarkably marginate and channelled, the under part round and smooth*.—A handsome shrub, four to five feet in height. The leaves are nearly four inches in length, and of a very rich green colour. The flowers are produced in terminal panicles, coming out in the winter season.

It requires the stove-heat at all times, and may be increased by layers or cuttings. The soil should be loam and peat.

12. *ARDISIA CORIACEA* (coriaceous *Ardisia*). *Flowers panicled; leaves oblong, entire, veinless, coriaceous*.—A native of the Antilles. Introduced 1824.

13. *ARDISIA SERRULATA* (saw-leaved *Ardisia*). *Flowers panicled; leaves ovate, lanceolate, acuminate, wrinkled; stem, shrubby, pubescent*.—A native of the West Indies. Introduced 1820.

14. *ARDISIA LATERIFOLIA* (side flowering *Ardisia*). *Racemes lateral, axillary compound; leaves oblong, acuminate, entire; stem shrubby*. A native of the West Indies. Introduced 1793.

15. *ARDISIA EXCELSA* (laurel-leaved *Ardisia*). Gært. t. 77. *Racemes axillary, simple; leaves obovate, at the edge cartilaginous, serrated*.—A tree thirty feet high; native of Madeira. The calyx is five parted, with ovate lanceolate, equal, permanent leaflets. Corolla five-cleft almost to the base, the clefts twice as long as the leaflets of the calyx, stamens inserted into the corolla; style filiform; seed-vessel a superior, globose, coriaceous, smooth, black berry; having no receptacle, except a broad scar at the bottom of the berry, to which the seed is fixed; seed globose, of a pale colour, having a wide umbilical pit at bottom; covered with a thickish,

ingose-coriaceous, friable integument. introduced 1784.

Ardisia is an ornamental genus of plants, much valued by collectors for the beauty of their foliage, flowers, and berries. They are of easy culture; cuttings strike root freely in a pot of sand, plunged in a moist heat, under a bell-glass. The only greenhouse species are *A. excelsa* and *A. crenulata*. They sometimes ripen fruit, from which young plants are readily produced.

ARDUINA (in honour of Pietro Arduini, creator of the garden at Padua).

Class Pentandria Digynia. Nat. Ord. Apocinæ.

The Characters are—*Corolla funnel-shaped, curved; stigma bifid; berry two-celled; seeds solitary, oblong.*

ARDUINA BISPINOSA (two-spined Arduina). Bot. cab. 387. *Leaves cordate, ovate, mucronate, subsessile; spines bifid at end.*—This is a low shrubby plant, seldom rising above four or five feet high. It sends out spreading branches in pairs from top to bottom; they are covered with a dark-green bark, and are armed with short, strong thorns, which come out by pairs; and sometimes there are double pairs upon the same footstalks; these are situated just below the leaves, and where there are four, two point upwards and the other two downwards. The leaves are heart-shaped, not much larger than those of the box-tree (about an inch long, and three quarters of an inch broad at their base), of the same consistence and colour, terminating in acute points; they are placed opposite, in pairs pretty close together, and continue green all the year. The flowers come out in clusters at the ends of the branches, upon short slender peduncles, each supporting five or six small white flowers, having an agreeable odour. They commonly appear in July and August; and are seldom succeeded by seeds in England. The berries do not ripen till the spring following, and are then of a deep red colour. It is a native of the Cape of Good Hope, whence the seeds were brought to Holland, and first raised in the gardens there.

Mr. Miller cultivated it at Chelsea in the year 1760.

It may be increased by cuttings, planted in July, and shaded from the sun; when they have taken root they should be removed into small pots, and

placed in the shade till they have taken root again; they may then be removed to a sheltered situation till autumn, when they must be put into a greenhouse, or under a hot-bed frame; this plant being too tender to live in the open air.

AREA is the internal capacity or contents of any given boundary or limits, of what figure or shape soever it be.

ARECA.

Class Monœcia Monadelphica. Nat. Ord. Palmæ.

The Characters are—*Common spathe two valved; MALE, calyx three parted; petals 3; stamens 6, cohering at base; FEMALE, calyx three-leaved; petals 3; nectary, six-toothed; styles 3, very short; drupe, one-seeded.*

1. ARECA OLERACEA (esculent Cabbage-tree). Jac. A. t. 170. *Fronds pinnated; leaflets linear, acute; fruit oblong, incurved.*—The cabbage-tree is the highest of the American Palms, and is very distinct from the East Indian Areca. The sheaths of the leaves are very close, and form the green top of the trunk, a foot and a half in length. Below this come out green shining spathes, which fall to the ground when the very branching sphadix bursts forth. The calyx of the flower is one-leaved, cut half way into three segments. The fruits are oblong, obtuse berries, slightly bent, of a blue purple colour, succulent, scarcely fibrous, the size of a middling olive; the pulp dries away, and becomes a brittle, wrinkled bark. The nut or stone is oblong, smoothish, rather acute at the base, membranaceous, brittle, thin, whitish-brown, frequently with a shade of red. The kernel is oblong, cartilaginous, very hard, and has a cavity in the middle of a small fissure.

The inhabitants cut off the green top of the trunk, take out the white heart of two or three inches in diameter, consisting of the leaves closely folded together, and expose it for sale in the herb market. It is eaten either raw, with pepper and salt, or fried with butter, and has then somewhat the taste of an Artichoke.

The Jamaica cabbage-tree, says Dr. Patrick Browne, is frequent in most of the sugar-islands, and grows commonly to a moderate size. The body of the tree is generally pretty tall, upright and even; and throws out its flowers

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immediately under the column formed by the sheathed bottoms of the ribs: these in the size and disposition, as well as in the form of both their bunches and covers, are very like those of the Barbadoes Palm; and its foliage, as in that plant, affords a delicate wholesome green, which is commonly called Mountain-Cabbage; and for which it is generally cut down. The outward part of the tree is used for lathing, and boards for out-houses; the seeds serve to feed the wild hogs in the season, and the spathe are frequently made into mats by the negroes.

The best cabbage is obtained when the tree is young, and not above fifteen or sixteen feet high. The fruit is devoured by birds, who mute the stones, by which means there is a continual nursery of these trees, which otherwise would soon be extirpated. The external coat of the trunk is impenetrable to a musket-ball, though it is scarcely an inch thick; and within this is a pithy farinaceous substance similar to some others of the palm kind.

The *Barbadoes cabbage-tree*, says Browne, is the most beautiful tree I have ever seen, and may be very lawfully esteemed the queen of the woods; it grows to a very considerable size; rises by a small straight trunk, which bilges moderately at some distance above the root; and shoots by a round tapering body to the top, where it spreads into a large and beautiful foliage, not unlike that of the cocoa-nut tree. The lower part of each rib is pretty broad, and formed into a sheath which embraces all those that grow between it and the centre; so that they continue the form of the trunk for some space above the real summit of the stem, whence it throws out, on opposite sides, two large branched bunches, well beset with mixed flowers; but these continue covered by a simple spathe, until all the parts are ready for generation. Both the bunch and sheath resemble those of the cocoa-nut palm very much; but the spathe of this is more soft and delicate, and the bunch more fertile and spreading; though the fruit is very small, and seldom exceeds the size of a pea.

The seeds of this beautiful tree were first carried to Jamaica by his excellency Admiral Knowles, then governor

of the island; and it has been since cultivated there with great care. It is chiefly planted for its beauty, and seldom or never cut down for the cabbage, or for any other use.

Ligon and other travellers speak of cabbage-trees from one hundred to two hundred, two hundred and fifty, and even three hundred feet in height, with a trunk no bigger than a man's thigh. More modern travellers are not willing to allow them a greater height than from thirty to a hundred feet.

The West-Indian cabbage-tree was introduced into the royal garden at Kew in 1787, by Hinton East, Esq.

2. *ARECA CATECHU* (medicinal Cabbage-tree). Rox. c. t. 75. *Fronde pinnate; leaflets plaited, terminal, bitten off; stems and spadices smooth.*—It has no branches, but its leaves are very beautiful; they form a round tuft at the top of the trunk, which is very straight, round, covered with a smooth ash-coloured bark, and marked with parallel rings. It grows to the height of forty or fifty feet, and is six or eight inches in diameter, and makes a very ornamental appearance. The shell which contains the fruit is smooth without, but rough and hairy within; in which it much resembles the shell of the cocoa-nut. Its size is equal to that of a large walnut. Its kernel is the size of a nutmeg, to which it bears some resemblance. In the centre of the fruit, when soft, is contained a greyish moist substance, which grows hard in proportion as it ripens. The extract of this nut has been supposed to be the *terra japonica* of the shops; but according to later observations, the genuine drug seems to be obtained from *A. catechu*.

The fruit when ripe is astringent, but not unpalatable, and the shell yellowish. Of this fruit there is a prodigious consumption in the East Indies, there being scarcely any person, from the richest to the poorest, who does not chew it with the leaves of the *betel*, generally mixing with it lime made of sea-shells to preserve the flavour longer in the mouth.

When prepared for mastication, it is called *pinang*, a Malay word used all over the East Indies. The chewing of *pinang* causes much spitting, whether it be made with dried or fresh *Areca*, and tinges the teeth and spittle of a

deep red colour. This mastication cools the mouth and fastens the teeth. When they have done chewing the pinang, they spit out the gross substance that remains in the mouth, and wash the mouth with fresh water, and their teeth then resume their natural colour.

The Europeans who live at Batavia and Malacca, and in the Funda or Mollura islands, use pinang as much as the Indians do, but by washing their teeth they preserve them white. It is esteemed for sweetening the breath, as being good against the scurvy in the gums, and as strengthening the stomach and appetite. When eaten by itself, as is sometimes done by the Indians, it impoverishes the blood and causes the jaundice, but not when mixed in the usual way with betel. The best Areca of the Indies comes from the island of Ceylon. The Dutch East India Company send a great deal of it to Bengal. A decoction of the nuts is also used in dyeing, and is supposed both to set and enliven the colours. For these purposes several vessels are sent yearly from CochinChina to China and India.

This palm is a native of the East Indies. It is cultivated everywhere in CochinChina, not only on the coast but in the mountains. In the southern provinces of China it is rare, but in those of the North it is never seen.

The species of this genus can only be raised from seeds, which should be sown in light sandy loam, and requires a stove that is kept rather warm.

ARENARIA (from *arena*, sand, in which most of the species are found).

Class Decandria Trigynia. Nat. Ord. Caryophyllæ.

The Characters are—*Calyx* of 5 sepals; *petals* 5, entire; *stamens* 10, or fewer, from abortion; *styles* 3; *capsule* one-celled, three-six valved at the apex, many seeded.

1. *ARENARIA PINIFOLIA* (pine-leaved Sandwort). Biet. fl. taur. 348. *The leaves setaceous, stiff, stem ones straight.*—The stems are distorted, ascending, pubescent, and few-flowered. Peduncles terminal, two; flowers white. A native of the Caucasus, nine inches high; flowering in June and July. Introduced 1823.

2. *ARENARIA SEGETALIS* (corn Sandwort). Vail. par. t. 3. f. 3. *Smooth;*

stem erect; leaves subulate, one-sided; petals white, shorter than calyx.—A native of France; flowering from June to October. Introduced 1805.

3. *ARENARIA RUBRA* (red Sandwort). Eng. bot. t. 852. *Stems prostrate, hairy; leaves linear, tipped with a small bristle, filiform, shorter than the joint; sepals lanceolate, obtuse, scarious at edge; seeds compressed, angular, roughish.*—This species of *Arenaria* is one of the most common in dry sandy fields, spreading widely on the ground, and flowering in July and August, but the blossoms expand only in bright weather, when their beauty and brilliancy will be found worthy of an accurate examination. Linnæus says the flowers open at nine o'clock, and close between two and three.

By the figure of the seeds and the bristles that terminate the leaves, this plant is distinguished from *A. marina* and its varieties.

4. *ARENARIA RUBELLA* (little red Sandwort). Curt. Lond. *The leaves awl-shaped, bluntish; stems single flowered; calyx leaves with three equal ribs, longer than the petals.*—The plant forms dense tufts, each with a long central root. Stems very numerous, ascending, two or three inches high, leafy, downy at the summit, each bearing a solitary flower. It is perennial; flowering in June. Native of the highlands of Scotland.

5. *ARENARIA MARINA* (marine Sandwort). Eng. bot. t. 958. *Leaves semi-cylindrical, fleshy, awny; stems prostrate, nearly smooth; seeds compressed, bordered, smooth.*—The root is spindle-shaped and strong, though annual; stems spreading circularly, quite smooth, except at the summit, as in *A. rubra*, with which this species agrees in most respects, but essentially differs from it in the following characters. The leaves are fleshy, semi-cylindrical, destitute of a bristle at their points; the flowers and capsules are considerably larger, especially the latter; but the seeds more peculiarly distinguish *A. marina*, being (instead of wedge-shaped, with a rough external edge) round, flat, smooth, and encircled by a membranaceous border, which varies in breadth and colour, being either white and elegantly striated, or brownish and less conspicuous.

The leaves being succulent are

gathered, pickled, and sold for samphire.

It is common on most parts of the British coast in salt marshes. Flowering from June to August.

6. *ARENARIA JUNIPERINA* (juniper-leaved Sandwort). *Leaves subulate, rigid, spiny; lower fascicled; upper distant; stems erect, firm; petals obovate, twice as long as calyx.*—The root is perennial; stems very many, half a foot high, slightly pubescent; flowers in terminal panicles on smooth, filiform, one-flowered peduncles, they are white and produced in June and July; capsules three-valved, obtuse, shining, a little longer than the calyx; the seeds are numerous, sinuate, compressed, roundish and black. A native of the Levant as well as in Eastern Siberia. Introduced 1800.

7. *ARENARIA AUSTRIACA* (Austrian Sandwort). Jacq. a. t. 270. *The leaves linear subulate, three-nerved; stem panicled; peduncles terminal, very long, twin, downy; petals obtuse, emarginate; plant six inches high, perennial.*—Stems ascending, at top dichotomous, or triehotomous; leaves connate at the base; stems, peduncles, and calyx villous; capsule five-valved, shorter than the calyx, which is pressed close to it: seeds pale brown.

Native of the mountains of Austria, Switzerland, and Piedmont; flowering from June to September. Introduced 1793.

8. *ARENARIA Verna* (vernal Sandwort). Eng. bot. t. 512. *Tufted, many-stemmed; leaves subulate, obtuse, nerved; stems panicled, elongated.*—This is a mountainous plant, a native of different parts of the European continent, and also of some places in Britain, as in Cornwall, about the lead mines, Derbyshire, as well as in Yorkshire, Westmoreland, and Wales. In Scotland, about Arthur's seat, &c. It is of very low growth, seldom exceeding two inches from the ground. From its early flowering (it begins in March) and long continuance, sometimes till September, it is well worthy a place in every collection, the more so as it does not occupy much room, a pot of three or four inches diameter being fully sufficient.

It should be planted in sandy loam, and may be readily increased by dividing the roots in the spring. Being per-

factly hardy, it requires no other care than watering in dry weather.

9. *ARENARIA SAXATILIS* (rock Sandwort.) Gm. sib. t. 63. f. 2. *Leaves subulate; stems panicled; sepals ovate.*—This is perennial, and the roots put forth an incredible number of stems, forming a very thick tuft; from four inches to a span in height, branching much, and very full of flowers; peduncles short, one-flowered; petals white, larger than the calyx. The whole plant is smooth.

Scopoli describes the stem as biforous; the peduncles villous; the leaflets of the calyx smooth, with white edges, and marked with three lines; petals woolly at the base; seeds about eight in a capsule, brown and kidney-shaped.

Native of France, Germany, Switzerland, Carniola, Siberia. Flowering in July and August. Introduced 1732.

10. *ARENARIA TENUIFOLIA* (fine-leaved Sandwort). Eng. bot. t. 219.—*The leaves awl-shaped, opposite; stem panicled; capsules erect; petals lanceolate, shorter than the calyx.*—The small annual root bears several branching stems, varying much in size according to the degree of moisture they are supplied with. Flower-stalks solitary, single-flowered, erect, longer than the leaves, and so numerous as to make the stem look like a panicle. It grows in dry sandy fields, on walls, and contenting itself with very spare nourishment, though not succulent, so as to resist much drought. Accordingly it flowers early in summer. They are very small and inconspicuous, and rarely expand but in bright sunshine, are quickly past, and is soon entirely dried up. Its seeds produce another crop the following spring.

11. *ARENARIA RECURVA* (recurved-leaved Sandwort). Jacq. col. t. 16, f. 1. *Radical leaves clustered, recurved, subulate, one-sided; stems tufted, simple, three-flowered; sepals and peduncles hairy, glandular.*—Root biennial, consisting of many, long, round, yellowish, tough fibres, collected into one head, and producing a tuft of stems, a finger's length, with bundles of leaves in the form of a rose at their base. Leaves somewhat straightened, even, round, flattish above, ending sharp: on each stem usually three, sometimes four pairs. The top of the stem commonly forks

ice, and bears two or three, sometimes four flowers. Calyx ovate-lanceolate, ending in an awn, and marked with three streaks. The stem and peduncles very slightly pubescent. Petals white, a little longer than the calyx, awned entire. Native of Provence, and the high alps of the Valais in Piedmont, in rocky pastures. Also of St. Gothard, St. Bernard, Engadine, and other very high mountains of Switzerland; flowering in June and July. Introduced in 1822.

12. *ARENARIA FASCICULATA* (fascicled-leaved Sandwort). Eng. bot. t. 744. *Stem erect, straight; flowers rounded; leaves awl-shaped; petals very short; lateral ribs of the calyx dilated.*—The root is annual, zigzag, tapering. Stem one or more, four or five inches high, erect, round, leafy, nearly smooth, alternately branched, upwards, the branches many-flowered, dichotomous at length, level topped. Leaves rigid, very slender, permanent till the stem decays. Calyx leaves all nearly equal, acute, smooth, green at the heel, with a slender white central line on each side reaching almost to the margin, an important mark of this species. Petals small, white. Capsule oblong, of three valves. Seeds beautifully toothed, on long stalks. It flowers in June. Native in sandy or gravelly sunny places, in many parts of Europe. In Scotland on rocks.

13. *ARENARIA LANCEOLATA* (lanceolate-leaved Sandwort). All. f. ped. t. 26, f. 5. *Tufted, villous; branches ascending; the leaves lanceolate, narrow, acute, rigid, nerved.* Native of the Alps of Piedmont, in strong pastures, flowering in July and August. Flowers white. Introduced in 1820.

14. *ARENARIA MONTANA* (mountain Sandwort). Bot. Mag. 1118. *Pubescent; leaves lanceolate, linear; barren stems very long, procumbent; peduncles terminal, long, one-flowered.*—This plant is one of the largest of the genus, reaching sometimes, when supported by the bushes, amongst which it prefers growing, to the height of a foot and a half or two feet, and is covered with a soft pubescence. The leaves when dry are rough; the flowers are specious enough to attract attention; the capsule is conical, one-celled, splitting at the point into six valves; the seeds are numerous, kidney-shaped, and of a brown colour.

It is a perfectly hardy perennial; flowering from April to June; should be planted in bog-earth, in a shady and damp situation. Propagated by dividing its roots. Native of the south of France on sterile mountains. Introduced 1800.

15. *ARENARIA TETRAQUETRA* (square stalked Sandwort). All. p. t. 89, f. 1. — *Leaves ovate, carinate, recurved, edged, imbricated four ways; stems straight, downy; sepals rigid, acute, keeled.*—Allione describes the root as oblong and perennial; the stem with many upright branches; the leaves connate, firm, recurved, acute, furnished with a nerve, near the root longer than the internodes, but shorter on the branches. Flowers five or six, heaped into a head. Leaflets of the calyx five, resembling the stem-leaves; petals nearly equal to the calyx. Of the ten stamens five are shorter than the corolla, or sometimes a little longer. The stem, leaves, and calyxes, viewed through a magnifying-glass, appear rough; their edges are scariose and silvery. D'Asso says, that the plant which he saw was scarcely an inch high; in the gardens it grows to near a foot. The flowers are white.

It is a native of the Pyrenean mountains, Arragon, the mountain of Tende, &c. Flowering in July or August. Introduced in 1776.

16. *ARENARIA CILIATA* (fringed Sandwort). Eng. bot. t. 1745. *Leaves ovate and obovate, blistered; rugose more or less nerved and ciliated; stems procumbent.*—The root is much branched, bearing numerous stems, which are repeatedly branched in their lower part. The flowers are of a brilliant white, erect: on longish, solitary, terminal, simple stalks, clothed with fine white recurved down; capsule short, ovate; when it grows in a barren soil, it is straight and less branched; is perennial; flowering in autumn. Though found in Ireland, and very abundantly in Switzerland, France, &c., it is seldom seen in the British isles, having been met with principally on the calcareous cliffs of a high mountain, adjoining to Ben Bulbin, in the county of Sligo, Ireland.

17. *ARENARIA TRINERVIS* (three-nerved Sandwort). Eng. bot. 1483. *Stem slender, much branched; leaves ovate, acute, stalked, ciliated, nerved;*

peduncles long, bent down after flowering.—The root is annual; stems upright, but weak, and trusting to other plants for support. The flowers are small, white, on longish solitary stalks, each proceeding from a fork of the stem. Capsule opening with six revolute teeth. Seeds black and smooth.

Incurious observers may pass by this little plant as a variety of the common *Stellaria media*, to which it bears some resemblance in general aspect; but its paler hue, and uniform downiness, readily distinguish it. When examined more carefully, the undivided petals and the three-ribbed leaves mark it decisively.

It grows in shady bushy places, for the most part on a rather moist but not boggy soil. It is also partial to calcareous grounds, and flowers in May and June.

18. *ARENARIA SERPYLLIFOLIA* (thyme-leaved Sandwort). Eng. bot. 923. *Leaves ovate acute, sessile, regular, ciliated and smooth; sepals lanceolate, three-nerved, acute, green, opaque.*—This little neat annual plant is sufficiently distinguished from its congeners, by the stiffness of its stalk, and the thyme-like form of its leaves. When rubbed, has a faint herbaceous smell. It is common on walls among rubbish, and on dry barren places not only in Europe but in Japan; flowering from May to August.

It is also common in North America in cultivated ground and on road sides from New York.

19. *ARENARIA BALEARICA* (Balearic Sandwort). *Leaves ovate, shining, rather fleshy, ciliated.*—This is a pretty little perennial plant, growing in tufts; stems branching, creeping, rooting at the knots, filiform; branches very numerous, opposite; leaves opposite, petioled; peduncles terminating, solitary, erect, very long, one-flowered, filiform, pubescent; flowers large, white, with two opposite, sessile, lanceolate bractes. It flowers from March to August. Introduced 1787.

CULTURE.—The Arenarias or Sandworts are small herbaceous annual or perennial plants, generally considered as weeds in the countries where they grow naturally, and not cultivated in gardens. About one hundred and fifty species are known to the botanist.

The greater part of these plants are

natives of Europe, and most of them affect mountainous situations. They have neither size nor brilliancy enough to be generally cultivated in gardens; many of them, however, are neat elegant plants. The perennial sorts may be increased by slips, or parting the roots. Both these and the annual sorts may also be propagated by seeds. They require no other care but what is necessary for all hardy vegetables.

ARETHUSA (a nymph of Diana who was transformed into a fountain).

Class Gynandria monandria. Nat. Ord. *Orchideæ*.

The Characters are — *Lip united at base, with the column; at the end hooded, in the inside crested; sepals free, united at base; pollen angular.*

1. *ARETHUSA BULBOSA* (bulbous Arethusa). Bot. Mag. t. 2204. *Flowers large, solitary, lilac.*—This very rare and curious plant, whose habit is altogether singular, is a native of the mountains of Carolina, and in sphagnum morasses from the northernmost to the most southern section of the United States. It has no leaves: the flower stalk is nearly a foot in height, and the flower is produced in the commencement of the summer. The root is perennial, bulbous, globose in shape, of a yellowish colour, with radicles from the under part; stem leafless, the uppermost one, in luxuriant specimens, foliaceous, perpendicular, straight, cylindrical, of a yellow-green colour and smooth, crowned by one elegant rose-red flower, which is agreeably odorous.

It is of difficult cultivation: we have found it to succeed best potted in sandy peat earth, kept in a frame during the winter, and removed into the shade in the summer. It should be kept moist, as it grows in swamps in its native country. The seeds should be sown as soon as ripe.

ARETIA (In honour of Benoit Aretion a Swiss botanist. He died 1574).

Class Pentandria Monogynia. Nat. Ord. *Primulaceæ*.

The Characters are—*Capsule enclosed; corolla hypocrateriform, contracted at the orifice; stigma globose.*

1. *ARETIA HELVETICA* (imbricated Aretia). Schk. tran. t. 32. *Stems rounded; leaves imbricated; flowers sessile.*—Root perennial, producing innumerable stems forming thick tufts, which cover the rocks where it grows;

they rise only two or three inches, and are entirely covered with hard, dry, small, very short leaves, having a pile of forked hairs on them. One flower terminates each branch: a large calyx, rough with hairs like the leaves, covers the whole: corolla white, with five buff yellow glands and a greenish-yellow circle at the entrance of the tube. Fruit roundish, with angles, inclosed in the calyx, opening at top by five valves, whence issue two or three blackish, oblong seeds, convex on the outside, angular on the inner side, plunged in a spongy receptacle, which partly covers the capsule.

The seeds are longer, darker, and fewer in number than in *Primula* and *Androsace*. The germ contains rudiments of five seeds, two or three of which are abortive.

Native of the western alps of Switzerland, and of Dauphiny; flowering in May and June. Introduced 1775.

2. *ARETIA ALPINA* (linear-leaved Aretia). Bot. Cab. 297. *Villous; scapes one-flowered*.—This charming little plant is a native of the alps of Switzerland. It never exceeds one or two inches in height, and forms a neat and proper plant for rock-work. The flowers are produced in April, and continue for near two months in perfection. It may also be kept in a pot, in loam, without any protection. Introduced 1775.

ARETIA VITALIANA (grass-leaved Aretia). Bot. Cab. t. 166. *Stem branching; leaves smooth above; peduncles short; petals conniving*.—This pretty little plant is a native of the Pyrenees in very elevated situations, where it forms a sort of turf, not growing above an inch in height, flowering in April and May. It is perfectly hardy, and a very suitable plant for a rock, on which it will be found very ornamental, as it retains its foliage throughout the year.

Propagated by dividing the roots in spring; they should be planted in light undunged loam.

4. *ARETIA PUBESCENS* (pubescent Aretia). Bot. Cab. 1273. A native of the alps of Switzerland lately introduced. It is a minute and very pretty plant, rarely more than one inch high, flowering in June and July. It is quite hardy, and succeeds very well in a small pot, in light loam.

CULTURE.—These little alpine plants

are not preserved in gardens without some difficulty. They are very delicate, require a good air, skilful cultivation, and a shady situation, are best grown in pots, or to ornament rock-work: and if the seeds can be procured, they should be sown as soon as possible.

They may also be propagated from offsets or slips, and by parting the roots.

ARGEMONE (from *argema*, the name by which the cataract of the eye was known, and which was thought to be cured by this plant).

Class Polyandria Monogynia. Nat. Ord. *Papaveraceæ*.

The Characters are—*Calyx three leaved; petals 6; capsule half-valved*.

1. ARGEMONE OCHROLEUCA (straw-coloured Argemone). Swt. b. fl. g. t. 242. *Leaves sessile, very deeply sinuate, undulate, glaucous, elegantly painted up the centre and along the middle of the lobes with bluish white; lobes spreading, toothed, the teeth and points acute and terminated by sharp spines; nerves spiny*.—The present plant is readily distinguished from *A. Mexicana* by its narrower, deeper divided, and sharper leaves; by the shape and the deep channels of the capsules, and very readily by its distinctly spreading stigmas; those in *A. Mexicana* being so crowded together that it is difficult to separate them; from the other two species it is readily distinguished at first sight.

It is a very handsome annual plant, attaining the height of three or four feet, and continuing to bloom from August to October. The flowers are terminal, solitary, pale straw-coloured the young branches growing beyond them. It may be planted in the open borders in April or May; thriving well in common garden soil, and the seeds ripen in abundance.

2. ARGEMONE ALBIFLORA (white-flowered Argemone). Bot. mag. t. 2432. *Leaves spiny; flowers on nearly naked peduncles*.—In *A. albiflora* the leaves are narrower than in *A. Mexicana*, much less sharply spined, with the veins only faintly marked with white, but the principal difference is that the flowers of the latter are for the most part nearly sessile, being embosomed in an involucre of leaves, whereas those of *A. albiflora* are on nearly the naked peduncles. It may be considered as an hardy annual, as its seeds are readily ripened in the open air.

3. ARGEMONE GRANDIFLORA (large-flowered Argemone). *Leaves sinuate, sessile, smooth; the nerves and veins not spiny.*—A native of Mexico, introduced by Mr. Barclay. It is a half shrubby plant, of free growth, producing its delicate flowers from June to October. They are larger than *A. Mexicana*, and are produced in greater abundance; being four inches across when expanded, of a pure white, interterminal panicles, forked at every division of the stem (which is between three and four feet high); the flowers in pairs. It requires green-house protection in winter, but thrives particularly well in summer planted out in a border, in which state it is very ornamental, and is certainly one of the grandest annuals that has been introduced for some time. It may be increased by seeds.

4. ARGEMONE MEXICANA (Mexican Argemone). Bot. mag. t. 243. *Capsule six-valved; leaves spiny.*—This species of Argemone is a native of Mexico and the West Indies, where we should suppose it to be a very common and noxious weed, from the name there given of *figue del inferno*, or the Devil's fig.

It has long been introduced to this country; Gerarde, who cultivated it with success, ludicrously attributes its nickname to a different source: "The Golden Thistle of Peru, called in the West Indies *figue del inferno*; a friend of mine brought it unto me from an island there, called Saint John's island, among other seeds. What reason the inhabitants there have to call it so it is unto me unknown, unless it be because of his fruit, which does much resemble a figge in shape and bignesse, but so full of sharpe and venomous prickles that whosoever had one of them in his throte, doubtless it would send him packing either to heaven or to —."

Its foliage is beautiful, somewhat like that of the milk thistle, its blossoms are large and showy, though not of long duration. The whole plant abounds with a sort of yellow juice, which flows out when it is wounded, and when reduced to a consistence is not distinguishable from gamboge.

Lunan, in his *Hortus Jamaicensis*, gives a curious history of the discovery of the narcotic properties of the seeds of this plant, which are said to be much stronger than opium.

It appears that one night a runaway negro visited a sheep farm, guarded by an old and infirm watchman, and desired him to select the finest of the flock for supper. The old man, conscious of his inability to resist, yielded an apparent consent, but asked his visitor to smoke a pipe with him first, to which he consented. The old man then slyly mixed a few grains of Argemone seeds with the tobacco before giving it to his visitor, who took it, unsuspecting of harm, but before he had half smoked out the pipe he fell into a profound sleep, during which the watchman had him secured and bound, and finding himself on awakening a prisoner, he declared the old man had used *obeah*.

The juice is esteemed very detestive, and generally used in diseases of the eyes: but the infusion is looked upon as a sudorific and resolute, which may be used with success on many occasions.

Though a native of a very warm climate, it is cultivated with as much facility as any annual whatever; in the gardens about London, where it has once grown, and scattered its seeds. It comes up spontaneously every spring, flowers in July and August, and ripens its seeds in September; they are large, somewhat round, of a black colour, with a beautiful surface. A light rich soil and warm situation suits it best.

CULTURE.—Argemone is a genus of beautiful hardy annuals, and should be sown in the open flower border, about the end of March or beginning of April.

ARGIL (*Argilla* Lat., a sort of white earth like chalk, but more brittle). Potter's Clay.

ARGILLACEOUS in Agriculture, such ground or soil as contains a large proportion of clayey matter in its composition.

ARGILLACEOUS EARTHS, such as form with water a tenacious paste, or soft stones; they burn hard, are corroded by a strong coction in the concentrated mineral acids, but not acted upon by moderate digestion. They are the basis of earthenware. They vitrify with salts, with arsenic, with gypsum, and with difficulty with lead.

ARGILLACEOUS MARL, that sort of marl containing most clay. As a manure this kind of marl is the most proper for

ie sandy and light sorts of soil.

ARGYREIA.

Class Pentandria Monogynia. Nat. rd. *Convolvulaceæ*.

The Characters are—*Berry rounded viceless, four-celled; calyx colored, persistent, the outer sepals, largest; corolla five-parted, with a short thick tube, surrounding the nectary; stamens in the mouth of the tube, thickened at base, airy; anthers sagittate.*

1. ARGYREIA CUNEATA (wedge-leaved argyreia). Bot. Mag. 2170. *Leaves wedge-shaped, emarginate, beneath silky; peduncles two-flowered.*—The stem is shrubby and erect; calyx of five small, oval, imbricated, closely adpressed leaflets. Corolla funnel-shaped, of dark blood colour; tube contracted longer than the calyx; germen five celled, with four ovules, completely filling the cavity. A native of the Mauritius flowering from June to October. Introduced 1817.

2. ARGYREIA SPLENDENS (glossy-leaved Argyreia). Bot. Mag. t. 2628. *Leaves ovate entire; peduncles axillary.*—This climber has been long known in our stoves, and has been set some value upon, for the beautiful silvery silkiness of the leaves; they are not nearly so large as in *A. speciosa*, are ovate, very little or not at all cordate, the silkiness underneath more silvery, and not tomentose; the peduncles are shorter; the umbels not leafy; and the flowers much smaller and paler. A native of the East Indies, flowering in November. Introduced 1814.

3. ARGYREIA SPECIOSA (broad-leaved Argyreia). Bot. Mag. t. 2446. *Leaves cordate, tomentose, silky on the lower surface; peduncles longer than the petiole, umbellate, calyxes acute.*—This, one of the most beautiful species of the genus, was introduced by the late Sir J. Banks, from the East Indies, in 1778; but has but rarely flowered in our hot-houses, probably from having been generally confined to too limited a space. Lady Harland, of Oswell-park, Ipswich, in whose stove it flowered in August, September, and October, 1822, observes that "it is an evergreen, and being planted in the corner of a pit of mould, in the stove, its branches extend over a trellis about twenty-three feet, and, if allowed, would fill the house, being constantly growing all the year

round, so that the gardener is obliged to be continually cutting it in. The stem just above the ground measures eight inches in circumference. It would never flower in a pot, as it requires space for its roots, as well as a great deal of head room."

ARISTEA (from *Aristea*, a point or beard. The leaves are bearded).

Class Triandria Monogynia. Nat. Ord. *Iridaceæ*.

The Characters are—*Flowers superior, six-petaled, regular; after flowering, twisted spirally and persistent; capsule three-celled, many-seeded.*

1. ARISTEA CYANEA (woolly-headed Aristeia). Bot. Mag. t. 458. *Flowers headed; spathes many-parted, torn.*—It is a small fibrous rooted plant, rarely exceeding when in bloom the height of six or eight inches, and would be too insignificant for a green-house collection, were not its flowers of a very brilliant blue. It flowers from April to June. The blossoms do not expand fully unless the sun shines hot upon them. It grows naturally at the Cape of Good Hope. Introduced 1759.

The *A. Cyanea* is a plant easily propagated by parting its roots, as well as by seeds, will succeed in a small pot, and, though a greenhouse plant, will not be hurt by the moderate heat of the stove, but flower the better for it.

2. ARISTEA PUSILLA (flat-stemmed Aristeia). Bot. Mag. t. 1231. *Scape about one-flowered; leaves linear, lanceolate, a little falcate.*—Herb growing luxuriantly, and forming large tufts; stem three-seven inches high; leaves grass-like, of a very deep blackish green; corolla scentless, of an uniform deep blue colour, an inch or more in diameter; filaments whitish; anthers yellow; style and stigmas deep blue; capsule of the circumference of a common quill, an inch and a half long, three-furrowed, crowned by the persistent, hardy, spirally-twisted, decayed corolla.

A native of the Cape, flowering in July. Easily propagated by parting the roots. Introduced 1806.

3. ARISTEA SPIRALIS (spiral-flowered Aristeia). Bot. Mag. t. 520. *Flowers alternate; segments of flower equal.*—The root is stringy, the leaves ensiform and erect; the scape simple, erect, near a foot high, two-edged, jointed, slightly twisted; the spathe two-valved, entire; the flowers alternate, with short

peduncles, and mostly directed one way; the corolla consists of six equal petals, which expand evenly, are white within, with a purple base, and become transparent between the veins as they decline, when they close they twist round one another in a curious manner; the style is longer than the stamens, and terminates in three fringed stigmas of a bright purple colour. It is a native of the Cape, and requires the same treatment as the *A. cyanea*. Flowers in April and May. Introduced 1795.

4. *ARISTEA CAPITATA* (tallest Aristea). Bot. Mag. 605. *Heads of flowers alternate, spathe entire*.—This was introduced some years since from the Cape of Good Hope, of which it is a native. With us its beautiful flowers are produced in July and August: they are scentless. It is one of the very hardiest inhabitants of the green-house, and should be potted in sandy loam, mixed with peat earth. It increases itself by offsets. If the pot is placed in a pan of water during the flowering season, it very much improves the blossoms.

It is large and ornamental, with a stem from two to four feet high, nearly twice the length of the leaves; round, somewhat winged by the alternate decurrent cauline leaves; leaves upright, linear, ensiform stiffish, finely striated without any prominent rib-like nerve, polished, dark-green; produces abundance of seed, of which there are two or three in each cell, and by which it is easily propagated.

5. *ARISTEA MELALEUCA* (three-coloured Aristea). Bot. Mag. t. 1277. *Flowers alternate, three of the segments less than the rest*.—The root is fibrous and perennial, root-sheaths membranous, sphacelate short; leaves perennial, three or four inches high, two-three lines broad; stem annual, about a foot high, obovate; corolla three inches or more in diameter, style twice shorter than the larger segments; anthers about equal to filaments, upright, yellow.

Native of the Cape, growing among the bushes. It is a plant of great beauty, flowering in May and June. Introduced 1786.

CULTURE.—Most of the species of this genus thrive best in a mixture of sandy loam and peat. They are readily increased by dividing them at the root, or by seeds.

ARISTOLOCHIA.

Class Gynandria Hexandria. Nat. Ord. *Asarina*.

The Characters are—*Calyx 0; corolla petalous, ligulate, ventricose at base; capsule six-celled, many-seeded inferior*.

1. *ARISTOLOCHIA BILOBATA* (two-lobed Birthwort). Jac. a. t. 346. *Leaves two-lobed; stem twining*.—A native of Dominica and Hispaniola, covering the trees and shrubs; and flowering from November to January. The capsule is oblong, hexagonal, black, marked with six streaks, shaped like a basket, opening from the top into six parts, with a peduncle divided into six parts, hanging down, six-valved: partitions membranaceous. Seeds very many, brown. Introduced 1822.

2. *ARISTOLOCHIA TRILOBATA* (three-lobed Birthwort). Jacq. a. t. 146. *Leaves three-lobed; stem twining; corollas cylindrical, broken, saccate at base; lip cordate, cuspidate*.—A climbing plant, with an aromatic stem. The flowers are large and ventricose. The roots of this and *A. odoratissima* are accounted warm attenuants, and active diuretics and stomachics. They are administered as infusions, and greatly used among the slaves of Jamaica, where they naturally grow. This species abounds most on the north side of the island, and is therefore called the *contrayerva* of the north side. It is also a native of the South American Continent. Flowers in June and July. Introduced 1775.

3. *ARISTOLOCHIA LABIOSA* (lipped Birthwort). Bot. reg. 689. *Leaves reniform, roundish, cordate, amplexicaul; corolla incurved at base, saccate, two-lipped in the middle*.—The *ARISTOLOCHIA LABIOSA* is a handsome climber, the leaves being of a delicate lively green and the flower very large, beautifully variegated, and of a grotesque form; but its scent very offensive, resembling that of some of the stapelias, and not very unlike the smell of decayed fish.

It is a native of Brazil, flowering in July and August. Introduced 1821.

4. *ARISTOLOCHIA PENTANDRIA* (pentandrous Birthwort). Jacq. t. 224. *Leaves cordate, hastate, subtrilobate; stem twining; bracte cordate, embracing*.—The roots are slender and odorous, stems eighteen inches in length

rached, dark green, spreading on the round; flowers axillary, longer than the leaves, of a dark purple colour on the outside, but yellowish within. It flowers in May and June. A native of Cuba. Introduced 1828.

5. *ARISTOLOCHIA MAXIMA* (greatest Birthwort). Jacq. a. t. 146. *Stemorky next the root; leaves oblong, acuminate, three-nerved; stem twining; peduncles many-flowered; corolla incurved; lip ovate, mucronate.*—It has strong climbing stalks by which it mounts up to the top of the tallest trees; the leaves are four inches long, and as early as thick as those of the Common Laurel. The flowers come out in loose clusters at the ends of the shoots, each standing on a very long peduncle; seed vessels four inches long, and as much a circumference, with six longitudinal ribs, which are very prominent; seeds heart shaped. Native of Carthagera, lowering in July. Introduced 1759.

6. *ARISTOLOCHIA SIPHO* (broad-leaved Birthwort). Bot. Mag. t. 534. *Leaves cordate, acute; stem twining; peduncle one-flowered, with an ovate bract; corolla ascending; limb trifid, qual.*—This tree, being a native of North America, is perfectly hardy, and will grow to a very great height if properly supported; but as a climber is not able to support itself. The long cordate leaves, which are of a fine dark green, make a very handsome appearance, and if the branches were trained over an arbour or trellis-work, for which purpose the plant seems peculiarly adapted, would form a canopy impenetrable to the rays of the sun, or moderate rain.

The flowers are curiously formed, but being concealed below the leaves, are not conspicuous. They make their appearance in June. The root and bark have an aromatic flavour. It rarely ripens its seeds with us, but may be propagated by suckers. Introduced 1760.

7. *ARISTOLOCHIA TOMENTOSA* (downy-leaved Birthwort). Bot. Mag. t. 1369. *Stem twining; leaves stalked, cordate, downy beneath; peduncles solitary, without bracts, tube of corolla twisted back.* This species resembles *A. siphon* in habit, but differs in the limb of the corolla being more deeply divided; the form too is different as well as the colour; and the mouth quite open, instead

of being contracted as in that. It is a hardy climbing shrub. Native of North America, flowering in June. Introduced 1799.

8. *ARISTOLOCHIA ODORATISSIMA* (sweet-scented Birthwort). *Leaves cordate, ovate; stem twining; peduncle one-flowered, longer than leaf; lip cordate, lanceolate, longer than the corolla.*—It has a long round geniculated root, as thick as a finger, whence rises a round, green, climbing stem, taking hold of any tree or shrub it comes near, to the height of six or eight feet, covering them with its numerous branches, and putting forth leaves at every two or three inches. Fruit two inches long, hexangular, containing in six cells so many rows of small, flat, brown seeds, exactly the shape of a heart, the points lying inwards, and the bases to the angular capsule, which, when ripe opens, and the seeds drop out. The whole plant has a very strong and very grateful smell. In Jamaica, where it naturally grows, it is called *contrayerva* of the south side, to distinguish it from *A. Trilobata*. It has the same qualities with that, and is used for the same purposes. Introduced 1753.

9. *ARISTOLOCHIA INDICA* (Indian Birthwort). Rh. m. t. 25. *Leaves elliptical, blunt, somewhat emarginate, slightly cordate; peduncles many-flowered; corolla erect.*—The whole plant is bitter, without much smell. The stems are shrubby, branched and interwoven. Flowers dusky purple. The root is thought to be attenuant and deobstruent. Native of the East Indies and Cochinchina. Introduced 1780.

10. *ARISTOLOCHIA BERTICA* (Spanish Birthwort). Mor. t. 17, f. 6. *Leaves roundish, cordate, acute; stem twining; peduncles about three; corolla incurved; lip ovate.*—The root is very long, pale coloured, somewhat astringent, with manifest acrimony. The flowers are crooked, oblong, and of a very dark purple colour. The whole plant is odorous. It is an evergreen, flowering in January and February, and a native of Spain. Introduced 1597.

11. *ARISTOLOCHIA GLAUCA* (glaucous-leaved Birthwort). Bot. Mag. t. 1115. *Leaves cordate, ovate, blunt, glaucous beneath; stem twining; corolla incurved; lip ovate, retuse.*—The glaucous leaves not at all waved, and dark

purple flowers on long nearly straight peduncles, easily distinguishes the *glauca* from every other. It is a native of Barbary, flowering from June to August. Introduced 1785.

12. *ARISTOLOCHIA SEMPERVIRENS* (evergreen Birthwort). Bot. Mag. t. 1116. *Leaves cordate, oblong, acuminate; stem prostrate, flexuose, somewhat climbing; corolla incurved.*—There is a near affinity between this species and the *glauca*, the flowers in both are solitary; the stems climbing and angular; but the flowers of *sempervirens* are smaller, of a pale yellow colour, with deep red stripes, sometimes varying to dark purple on the outside; the peduncles twisted and hanging down, as if not able to support the weight of the flowers; the leaves are acuminate, as well as of a thicker texture. Native of the Isle of Candia. Flowers in May and June. Introduced 1727.

13. *ARISTOLOCHIA LONGA* (long-rooted Birthwort). Mill. ic. t. 52. f. 1. *Leaves cordate, ovate, retuse; stem prostrate, flexuose, somewhat climbing; corolla erect; lips lanceolate, acute.*—Long-rooted Birthwort is a native of the south of Europe and Japan. It has long tap roots, shaped like those of carrots; these send out weak trailing branches, which extend little more than a foot. The flowers are of a pale purple colour. The stalks decay in the autumn, and new ones are produced in the spring.

The roots are kept in the shops, and many authors represent them as being of an extremely hot and pungent nature, but such as are commonly met with among the druggists exhibit no very striking qualities of that kind. On first chewing them when dry, scarcely any taste is perceptible, but they soon fill the mouth with a nauseous bitterness, which remains for a long time.

As a medicine, they heat, stimulate, cut, and attenuate a tough phlegm, and promote the fluid secretions in general: but their principal efficacy consists in removing feminine obstructions, and promoting the necessary evacuations after delivery; whence its name. A dose is from a scruple to a drachm. S. Paulli informs us that the long Birthwort roots, applied as a fomentation, were found remarkably serviceable in stubborn ulcers of the legs. Cultivated by Gerard in 1796.

14. *ARISTOLOCHIA SERPENTARIA* (Virginia Birthwort, or Snake-root). Woodv. t. 106. *Leaves cordate, oblong, acuminate; stems flexuose, ascending; lip of corolla lanceolate.*—The root is perennial: the stems are slender, jointed, and rise about eight or ten inches in height. The flowers are solitary, monopetalous of a purplish brown colour, and placed upon long, sheathed, twisted peduncles. The root of this species has been highly extolled as an effectual remedy for the bite of the most poisonous serpents, and is said to be the substance which the Egyptian snake-jugglers chew for the purpose of stupefying the snakes by the introduction of their saliva into the reptiles mouth. It retains a place in the materia medica. The dried root is imported into this country from North America. It has an aromatic odour, not unlike that of Valerian, and a sharp, warm, bitter, pungent taste, resembling in some degree that of Camphor. Medicinally it is stimulating, diaphoretic, and tonic. The dose of snake-root is usually from ten to thirty grains in substance, and in a drachm or two in infusion. It is a native of Virginia, and flowers in August. Introduced 1632.

15. *ARISTOLOCHIA PISTOLOCHIA* (small Birthwort). *Leaves cordate, ovate, crenate; scabrous netted beneath; stem branched at base, flexuose, prostrate; corolla erect.*—It grows upon the dry stony places of Languedoc and Provence. It is used in cases of obstructed perspiration, and in disorders of the lungs. The roots should be chosen of a plump texture, and a yellowish colour. They should be newly dried, and possess an aromatic flavour and a bitter taste. It is a native of the South of Europe, flowering in June and July. Introduced 1597.

16. *ARISTOLOCHIA HIRTA* (hairy Birthwort). *Leaves cordate, ovate, blunt, downy, stalked; stem erect, hairy; peduncle solitary, one-flowered, corolla recurved.* It is thus described by the elegant Tournefort, who first observed it—"The root is a foot and a half or two feet in length, and two inches in thickness, hard, woody, yellowish, marbled with rays of white and russet, covered with a rough bark of a purplish colour: it has only few fibres, and is insupportably bitter. Stems two feet high, firm, solid, two lines in thickness, pale green

purplish at the base, lying on the ground. At each knot is a single leaf, three inches long, and two wide at the base; the upper surface is brownish-green, shining and veined, in trapeziums. From their axils spring a flower bent in the shape of an S, three inches and a half long, the base pale green mixed with purple, and angular; the tube is almost oval, the hollow of it is beset with white hairs; the bottom is purple, black, and livid, with some streaks of a paler colour, inclining to yellow; the inside of the tube is blackish purple, and covered with hairs. The flower is scentless. The whole plant is bitter." It has been recommended for the gout. A native of Scios. Introduced 1750.

17. *ARISTOLOCHIA CLEMATITIS* (common Birthwort). Eng. Bot. t. 388. *Leaves roundish, cordate, bluntish stalked; stem erect; peduncle one-flowered, heaped; corolla erect.*—The root of this species is long, slender, creeping, and perennial; stems many, nearly two feet high. The flowers grow five or six in a cluster from the bosom of each leaf, on shortish stalks, erect, pale yellow, appearing from July to September. They are of a very singular form. Like other vegetables that increase much by roots, it rarely ripens its fruit. As a medicine it is stimulant, stomachic, and emmenagogue; use has been made of it for different purposes, as for sarcoma, fistula, paleness of the countenance, &c. It is a native of this country, growing in woods and hedges.

18. *ARISTOLOCHIA ARBORESCENS* (tree Birthwort). *Leaves cordate, lanceolate; stem erect, shrubby.*—Called *Snake root* in North America, where it naturally grows to the height of two feet; the branches are not very woody, but are strong enough to support themselves; they are perennial. The flowers come out singly at the axils.

CULTURE. The herbaceous species will grow freely in common garden soil, and may be readily increased by dividing the roots.

The hardy shrubby kinds are very proper for planting in shrubberies, to run up the other trees, as their magnificent leaves make a fine appearance; and are increased by layers, or dividing at the root.

The greenhouse species require a mixture of an equal quantity of loam

and peat; cuttings root freely, planted under a hand-glass. They make good climbers for a conservatory, being free growers, and requiring but little care. A light sandy loam agrees well with the stove kinds, and cuttings root freely.

ARISTOTELIA (after the celebrated ancient philosopher and naturalist Aristotle).

Class Dodecandria Monogynia. Nat. Ord. *Homalinee*.

The Characters are—*Sepals 5; petals 5; style trifid; berry three-celled; seeds twin.*

ARISTOTELIA MAQUI (shining-leaved Aristotelia). Wat. dend. brit. t. 44. *Leaves opposite, evergreen, ovate, shining.*—Macqui is the name of this shrub in Chili. It grows freely in a sheltered situation. Its flowers are of little beauty; they are succeeded by small berries, of a purple or black colour, slightly acid and eatable. The inhabitants of Chili make a wine from them, which they give in malignant fevers. Dombey used the remedy with success in Chili against the plague in 1782. It is increased by layers or ripened cuttings. Flowers in April and May. Introduced 1776.

ARMENIACA (so called from the apricot being originally from Armenia).

Class Icosandria Monogynia. Nat. Ord. *Amygdalaceae*.

The Characters are—*Drupe ovate, globose, fleshy, covered with a velvety skin, containing a nut or stone, which is acute at one end and blunt at the other, with a furrow on both sides; the rest smooth, not wrinkled.*

1. *ARMENIACA VULGARIS* (apricot). *Flowers sessile, leaves ovate, glabrous.*—The apricot is a low tree, of rather crooked growth, with broad, roundish, cordate, glandularly serrated leaves. The flowers are white, tinged with dusky red; they appear in April on shoots of the preceding year, and on spurs of two or more years old; and the fruit ripens in September. The fruit is round, yellow both within and without, firmer than plums and most peaches, enclosing a smooth compressed stone, like that of the plum. It is of a lively rich flavour, nearly of the quality and temperament of peaches and nectarines. There is no fruit that receives so much improvement preserved in sugar; for an exquisite perfume, which was before latent, then becomes perceptible.

It is supposed to be a native of Armenia, and Pallas states it to be a native of the whole of the Caucasus, the mountain there to the top being covered with it. The fruit appears to have been known in Italy in the time of Dioscorides under the name of *Præcocia*, probably, as Regnier supposes, from the Arabic Berkoch, whence the Tuscan Bacoche, and the English Apricock or Apricot.

It appears from Turner's "Herbal," which is our earliest botanical authority, that the apricot was cultivated here in 1562; but it is affirmed by Hakluyt (1582) that the apricot-tree was first brought to Italy in the year 1524, by Woolf, gardener of Henry the Eighth, who, it appears, introduced several valuable fruits about the same period.

The fruit is used in a raw state at the dessert, and is esteemed next to the peach and nectarine; it is also made into marmalade, jellies, and preserves. The young fruit, which is gathered to thin the crop, makes an excellent tart. Grossier says that lozenges are made by the Chinese from the clarified juice, which, dissolved by water, yield a cool, refreshing beverage. Oil may be extracted from the nut, and the young shoots yield a fine golden-cinnamon colour to wool.

Parkinson, in 1629, enumerates six varieties; Ray, in 1720, seven; the Luxembourg garden catalogue of 1800, fifteen; but the catalogue published by the Horticultural society in 1830 enumerates forty-one. The following are the chief varieties.

1. *Kernels bitter.*

1. *Red masculine A.* An early and excellent fruit. It is small and roundish. The skin dull honey yellow. The flesh is juicy and tender, parting from the stone, and of a pale yellow colour.

2. *White masculine A.* Its chief recommendation is its early time of ripening.

3. *Large early A.* An excellent early sort, ripening about the middle of July. The fruit is large and oblong, skin downy, bright orange, red next the sun. The flesh is rich, juicy, and of an orange colour.

4. *Roman A.* This sort is more calculated for preserving than for the dessert, the juice not being so highly flavoured as that of many other sorts. The fruit is middle-sized, oblong, com-

pressed, dull straw colour, with a little dotting on the sunny side. The flesh is soft, it soon becomes mealy, and requires to be eaten rather before its maturity.

5. *Royal A.* This is a very valuable sort. The fruit is oval; the flesh is very firm, juicy, sweet, and highly flavoured, with a slight degree of acidity. It is of a pale orange colour.

6. *Shipley's A.* This fruit is rather more downy than the Roman, which it resembles in shape. The skin is clear yellow, minutely speckled with brown. The flesh is juicy, with a pleasant sweetish acid flavour, without much scent. It is of a very bright deep orange colour.

7. *Hemskirke A.* The flesh is tender and juicy, with a particular rich delicate flavour. It is of a very bright, deep, clear orange colour. The fruit is rather large, roundish, compressed.

8. *Brussels A.* The flesh is juicy, and rather crisp. The fruit is oval, compressed, of a pale orange colour, with deep, blood-red spots next the sun.

9. *Moorpark A.* (Brookshaw pom. brit. t. 33). This is one of the best of the kinds. The flesh is juicy, and of a high and excellent flavour peculiar to this sort, never liable to become mealy. It is of a dull reddish orange colour. The skin of a brownish orange colour. The fruit is large, of a roundish compressed shape.

2. *Kernels sweet.*

10. *Turkey A.* The fruit is very handsome, rather large, of a deep yellow, with a number of orange-red spots and blotches next the sun, nearly spherical, not compressed. The flesh is firm, juicy, sweet, with a little acid, very rich and excellent. It is of a pale yellow colour. Ripens on a south wall about the middle of August, and in other situations may be prolonged to the end of the month.

11. *Angoumois A.* The skin of this sort is yellow where shaded, but of a very deep reddish brown on the exposed side. The flesh is juicy, sweet, mixed with a slight acidity, which renders it very agreeable. It is of a reddish orange colour.

12. *Breda A.* The fruit is rather small and roundish, sometimes almost four-cornered. The flesh is juicy, rich, and highly flavoured, of a deep orange colour. Ripens from the beginning to

in the middle of August on walls, and its perfection is considerably prolonged on standards.

Estimate of sorts as bearers.—The *fasciculines* are good bearers, but are cultivated almost entirely because they are the *earliest* sorts. The *Roman* is a good bearer. The *Orange* grows freely, and bears well. The *Turkey* is an uncertain scanty bearer. The *Breda* is rather harder as a plant than any of the preceding, and a plentiful regular bearer. The *Brussels* is one of the earliest tender as a plant, and a good bearer. The *Moorpark* (Lord Dunmore's *Breda*, sometimes called the peach-pricot) is a scanty reluctant bearer; but then the fruit has the most elevated generous flavour.

Nursery Culture.—The apricot is cultivated principally as a wall-tree in this country; for as the plant flowers early, and the tender blossoms and fruit are extremely liable to be cut off by the frosts which prevail in March and April, they require to be considerably sheltered in that stage; nor will many of the sorts ripen fully without the aid of a sunny wall; but occasionally some are trained in espaliers and half and dwarf standards, particularly the *Breda* and *Brussels* kind. Standard apricots do not come into bearing under a considerable number of years, sometimes ten or twelve; but then the fruit, in a congenial situation, is abundant, and of the finest flavour; so when the prevailing fault of a particular sort is meanness, and yet it cannot be expected to ripen on even a dwarf standard, the medium course, of training the plant to a trellis almost touching a south wall, will improve the flavour. When the apricot-tree must be close to a wall, it is well adapted to come in as a rider between principal wall-trees.

Propagation.—New varieties are procured from the seed, and approved sorts are perpetuated by budding, generally on muscle and plum stocks. It is usually performed early in the season, from the middle of June to the end of July. Knight recommends budding the *Moorpark* on an apricot stock, which he has found prevents the trees from becoming diseased and debilitated, which they generally do on plum stocks.

For *dwarfs* the bud is inserted six or eight inches from the ground, and the sorts are sometimes twice budded, or

one variety budded on another, which is said to keep the riders in a more dwarf state.

For *riders* or *standards* they are budded on plain stocks, four or five feet from the ground. Miller prefers half standards, budded three or four feet from the ground, the trees so produced being less liable to suffer from high winds.

As the young tree advances with one main shoot immediately from the inoculated bud, and the shoot becomes two, three, or four feet in length, it should be topped either the same summer in June, or when a year old in March, down to six or eight inches, to obtain a supply of lateral shoots from the lower eyes, to form the head. Train the primary and secondary branches as the figure is to be, that of a wall-tree or standard.

Choice of Plants.—Abercrombie prefers trees of two or three years growth from the bud, and fit for immediate bearing. Forsyth makes choice of those plants which have the strongest and cleanest stems; and, if he can, such as have been headed down of three or four years' growth, as they will bear and fill the walls much sooner than those which have not been so treated. He says, "Make choice of trees with one stem, or, if they have two, one of them should be cut off; for, by planting those with two stems, the middle of the tree is left naked, and, of course, one third of the wall remains uncovered."

The season for planting.—Forsyth says the best season is in August, when the leaf begins to fall. Abercrombie recommends as the best time from the fall of the leaf until February or March.

Final Planting.—The young trees, raised as above, are proper for final planting, in maiden trees of one summer's growth, with the first shoot from the budding entire (and these should be planted in the summer or spring following, and then be headed down the subsequent March).

In *planting* allot some best south walls for the most select varieties, and for others south-east and west walls. Have the borders well prepared with proper soil (a light, rich loam, or other good, mellow, fertile earth), at least thirty inches deep. Let the trees be planted fifteen, eighteen, or twenty feet asunder. If they are designed for es-

paliers, plant them at the same distance.

Mode of bearing.—The varieties of the *apricot* in general bear upon the young shoots of last year, and casually upon small spurs, rising on the second or third years old fruit branches. The *Moorpark* bears chiefly on last year's shoots and on close spurs formed on the two years' old wood. The bearing shoots, emit the blossom-buds immediately from the eyes along the sides; and the buds have a round and swelling appearance.

Pruning small trees.—The general culture of wall apricots comprehends a summer and winter course of regulation by pruning and training.

Summer pruning.—Begin the summer pruning in May, or early in June, and continue it occasionally in July and August, &c. This pruning is principally to regulate the young shoots of the same year. In the first place take off close all the fore-right shoots, and others that are ill-placed or irregular, or too luxuriant in growth, taking care to retain a competent supply of choice, well-placed, moderately-growing, side shoots, with a good leader to each mother branch. Continue these mostly at their full length all the summer, regularly trained in close to the wall, to procure a sufficiency to choose from in the general winter pruning for new bearers next year. If the summer regulation commence early, while the shoots are quite young, and, as it were, herbaceous, one, two, three, or four inches long, those improper to retain may be detached with the fingers and thumb, but when of firmer growth they must be removed with the knife. If any very strong shoot rise in any casually vacant part, it may be topped in June, which will cause it to produce several laterals the same year, of more moderate growth, eligible for training in to supply the vacancy.

Thinning the fruit.—Sometimes the fruit are much too numerous, often growing in clusters, in which case thin them in May and the beginning of June, in their young green state, leaving the most promising singly at three or four inches distance, or from about three to six on the respective shoots, according to their strength.

Winter pruning.—This may be performed either at the falling of the leaf,

or in mild intervals from that time until the buds begin to swell; the promising shoots can be the better distinguished. It comprehends a general regulation, both of the last years' shoots and the older branches. A general supply of the most regular-placed young shoots must be every where retained for successive bearers the ensuing year. Cut out some of the most naked part of the two last years' bearers, and naked old branches not furnished with competent supplies of young wood, or with fruit-spurs either to their origin, or to some well directed lateral, as most expedient, to make room for training a general supply of the new bearers retained, and cut away all the decayed wood and old stumps. Generally observe in this pruning to retain one leading shoot at the end of each branch, either a natural-placed terminal, or one formed by cutting, where a vacancy is to be furnished with a proper leader. Let the shoots retained for bearers be moderately shortened; strong shoots reduced in the least proportion, cutting off one-fourth or less of their length; from weak shoots take away the third, and sometimes half. This shortening will conduce to the production of a competency of lateral shoots the ensuing summer, from the lower and middle-placed eyes; whereas without it, the new shoots would proceed mostly from the top, and leave the other part of the mother branch naked, and the lower and middle part of the tree, unfurnished with proper supplies of bearing wood. Never prune below all the blossom-buds, except to provide wood, in which case, cut nearer to the origin of the branch, as in those trees small fruit-spurs, an inch or two long, often appear on some of the two or three years' branches, furnished with blossom-buds; these spurs should generally be retained for bearing; but when any project foreright from the wall, cut them in accordingly, for the spurs projecting above three inches, though they may set their fruit, seldom ripen it, unless the season and situation are both favourable. The thick clusters of spurs, which are apt to form on aged trees, ought also to be thinned. As each tree is pruned, nail it, laying in the branches and shoots from three to six inches distance, straight and close to the wall.

Pruning standards.—Half standards

will require only occasional pruning, to regulate any branches that are too numerous, too extended, or cross placed, and to remove any casually unfruitful parts, and dead-wood. At the same time the regular branches forming the head of the tree should not be generally shortened, but permitted to advance in free growth.

Training the Apricot tree. Is generally done in the fan manner. Forsyth recommends a mode between the fan and horizontal manner. Forsyth had great success in *renovating old decaying trees*, by cutting down to within a foot or eighteen inches, or more occasionally of the ground, and then renewing the soil of the border.

The Apricot is apt to become mealy if left on the tree till over-ripe. It should be *gathered* with the peach-gatherer while moderately firm. As the fruit ripens early, it is very liable to be attacked by wasps and large flies, which should be kept off by a net, stretched a foot or more apart from the wall or trellis. The other insects, and the diseases of the tree, are the same as in the peach tree, but is not so obnoxious to their attacks, probably owing to the comparatively hard nature of its bark, wood, and coriaceous leaves.

2. *ARMENIACA DASYCARPA* (thick-fruited Apricot). Bot. cab. 1250. *Leaves ovate, acuminate, serrated; petioles glandular; flowers pedicellate; pedicels filiform.*—It is one of the earliest flowering trees, being usually in bloom in March, and is quite hardy. The flowers are white. The fruit is black and eatable, of the apricot form, but with an austere taste. This species is called *Abricot noir* in French gardens. It may be increased by layers, or by budding upon common plum-stocks. It is supposed to be a native of the Levant. Introduced 1800.

3. *ARMENIACA SIBIRICA* (Siberian Apricot). *Leaves ovate, acuminate; petioles glandless.*—In trans-alpine Dauria, the north side of the mountains in May are clothed with the purple flowers of *Rhododendron Dauricum*, and the south side with the rose-coloured blossoms of this tree. It is much like the common apricot in appearance, but smaller in all its parts. The fruit is small, juiceless, and sour or acid, and contains a bitter kernal. Introduced 1788.

CULTURE.—The species are all increased by budding, on the same kind of stocks recommended for the common *apricot*. They grow in any kind of soil, and are very ornamental for shrub-berries in spring.

ARMORACIA.

Class *Tetradynamia Siliculosa*. Nat. Ord. *Cruciferae*.

The Characters are—*Silicle ellipsoid; root-leaves lanceolate, crenate.*

1. *ARMORACIA RUSTICANA* (common Horse-radish). Eng. bot. t. 2223.—*Pods ellipsoid; radical leaves oblong, crenate; cauline long, lanceolate, toothed, or cut; root large, fleshy.*—This is a perennial plant, growing naturally in marshy places, and by the side of ditches. The leaves are very large, sometimes smooth, and sometimes notched at the edges; on the stem they are sometimes deeply pinnatifid. The flowers are white, and appear in loose panicles in May and June.

It is a native of this country, and has long been cultivated in our gardens, as we learn from Gerarde, who says, "Horse-radish for the most part groweth and is planted in gardens, yet have I found it wilde in sundrie places;" and adds, "Horse-radish stamped, with a little vinegar put thereto, is commonly vsed among the Germanes for sauce to eat fish with, and such like meates as we do mustard; but this kind of sauce doth heate the stomacke better, and causeth better digestion than mustard."

From this account it appears that horse-radish had not found its way to the English table in 1597, but was planted for its efficacy in medicine, of which Gerarde and other old writers gave ample commendation.

The root, scraped into shreds, is now a well-known accompaniment of English roast beef. It is also used in winter salads, in sauces, and sometimes eaten raw.

Horse-radish root has a quick pungent smell, and a penetrating acid taste: it nevertheless contains in certain vessels a sweet juice, which sometimes exudes on the surface. By drying, it loses all its acrimony, becoming first sweetish, and then almost insipid. Its *medicinal effects* are to stimulate the solids, attenuate the juices, and promote the fluid secretions. It seems to extend its action through the whole habit, and to affect the minutest glands. Its great activity and warmth also make it good

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In all such nervous cases as arise from cold and viscid juices; and induce heaviness of the senses, or inaptitude to motion, in the same manner as mustard and all such stimuli.

This volatile root, when received into the stomach, both creates appetite and assists digestion, and is, therefore, properly employed as a condiment with animal food. It impregnates both water and spirit very richly with its active matter, whether it is extracted by infusion or distillation.

M. Haller informs us that in Sweden they cultivate the Chinese horse-radish, from which they draw abundance of oil. Horse-radish scraped and infused in cold milk makes one of the best and safest cosmetics.

Horse-radish possesses the same peculiar property of propagating itself as the ginger; for a small piece of the root, if buried in the earth, will form a new root, and a perfect plant, which produces seed. In vain do we look into the pores of this root to discover by what wonderful means nature has endowed it with this gift, and we may justly exclaim with David, "Such knowledge is too wonderful for me: it is high; I cannot attain unto it."

It loves a moist deep soil; and we see many acres of ground on the borders of the Thames, east of London, covered with this plant, which brings a price in the metropolitan market that rewards the cultivator for the time it requires to mature the root.

CULTURE.—*Horse-radish* thrives best in deep, soft, sandy loam, that is not very dry in summer, nor inundated in winter; the situation most open. During winter trench the ground three feet deep, and in the following February procure your sets, in the choice of which take the strongest crowns, or leading buds from old plants, cutting them about two inches long. Mark out the ground in four-foot beds and one-foot alleys; then take from the first bed nine inches of the top soil, laying it upon the adjoining bed, after which take out an opening at one end of the bed in the common way of trenching, fifteen inches deep from the present surface; then level the bottom, upon which plant a row of sets across the bed at nine inches apart each way, with their crowns upright; afterwards dig the next trench the same width and depth, turn-

ing the earth into the first trench over the row of sets; thus proceeding trench after trench to the end.

Where more than the produce of one bed is required for the supply of the family for twelve months, the third bed next to be planted, which treat as directed for the first, only observing to lay the earth on the fourth, and so on for any number of beds. Upon every alternate bed, which is not planted, a dwarf annual crop may be grown.

The plants must be kept clear from weeds during summer, and as soon as the leaves decay in autumn let them be carefully raked off with a wooden-toothed rake; in the following February, eighteen inches of the earth of the unplanted bed must be laid as light as possible, and equally, over the beds that are planted; then trench and plant the vacant beds exactly in the same manner as before directed. The following autumn, the first planted horse-radish may be taken up by opening a trench at one end of the bed to the bottom of the roots, so that the sticks or roots of horse-radish may be taken up entire and sound, which for size and quality will be such as have not generally been seen. The following February the one-year old crop will require additional earth as before directed, which must of course be taken from those beds which are now vacant, which, when done, if the ground appear poor, or unlikely to produce another vigorous crop, they must have a coat of manure.

Preserving.—*Horse-radish*, if dug up in autumn, may be preserved through the winter in sheds or cellars, among sand or dry earth.

ARNICA.

Class Syngenesia Polygamia Superflua. Nat. Ord. Composite.

The Characters are—*Receptacle naked; pappus simple; involucrem with equal leaves; florets of ray, generally with five filaments without anthers.*

1. *ARNICA MONTANA* (mountain Arnica). Bot. Mag. 1749.—*Leaves orate, entire; cauline twin, opposite.*—This sort grows naturally upon the Alps, and also upon many of the mountains in Germany, and other cold parts of Europe, and is greatly esteemed by the Germans for its medicinal qualities. They say the whole plant has important medicinal properties; it is fortifying, diuretic, emmenagogue, vulnerary, antiseptic,

resolventive, and sternutatory. The root powdered is usually employed in diarrhoea, dysentery, and quartan-fevers. It is also applied outwardly to bad ulcers, and in cases of gangrene. The flower is used in asthma, rheumatic pains, bruises, gutta serena, and paralysis of the bladder. The root is given in doses of from six to twelve grains, the flowers of from eight to twelve drachms. It was formerly much used in medicine in this country, but has since fallen into disrepute.

The roots of this plant, when placed in a proper soil and situation, greatly increase; for they send out thick fleshy roots, which spread very far under the surface; these put out many oval entire leaves, from between which the flower-stems arise, which grow about a foot and a half high, having two or three pair of leaves growing opposite upon each, and the top is terminated by a single yellow flower, composed of many florets, like those of *Dandelion*. These are succeeded by oblong seeds, which are crowned with down, whereby they are dispersed to a considerable distance when ripe. It flowers in April and May, and the seeds ripen in September. Introduced 1759.

This plant delights in a moist shady situation; it may be increased by separating the roots in autumn, when the stalks begin to decay, or by the seeds if sown in autumn, soon after they are ripe, for those sown in the spring often fail; but if the seeds are permitted to scatter, the plants will come up the following spring, so that, when one plant is obtained, it will propagate itself fast enough, without other care but to keep it clean from weeds, as it is quite hardy.

2. *ARNICA SCORPIOIDES* (alternate-leaved Arnica). Jacq. a. t. 349. *Leaves toothed; teeth acuminate, radical, stalked, elliptical, roundish; cauline, alternate, oblong.*—It grows naturally on the mountains of Bohemia, as also in Siberia, from whence I received the seeds. The roots of this sort are much jointed, and divide into many irregular fleshy offsets, which are variously contorted, and are fancied to resemble a scorpion, from whence many persons have been led to imagine that the roots would expel the poison of scorpions, and cure the wounds made by the bite of that animal. The roots and the whole plant have a strong disagreeable

smell, especially in the shade, and exposed to the north. It is a very hardy plant, and is propagated in the same manner as the *Montana*. Cultivated by Mr. Miller in 1759.

It flowers in the beginning of the summer, and may be kept in a small pot in light loam, and increased by separating the roots in spring.

3. *ARNICA DORONICUM* (Clusius's Arnica). Jacq. aust. t. 92. *Leaves remotely toothed, hirsute; radical stalked, oblong, narrowed at base; cauline alternate, oblong, lanceolate.*—This plant varies much in its leaves. The stem always bears one flower. It is a native of the high Alps of the Grisons, Daphiny, Piedmont, Austria, &c. Flowering in July and August. Introduced 1816.

4. *ARNICA MARITIMA* (sea-side Arnica). *Leaves lanceolate, the lower ones serrate; stem leafy, many-flowered.*—Native of Kamtschatka and North America. Flowering in July. Introduced 1821.

CULTURE.—All the species of this genus grow best in a light loamy soil, and may be increased by seeds or dividing at the root.

ARNOPOGON.

Class Syngenesia Polygamia Æqualis. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle naked; pappus feathery, stipitate; involucre one-leaved, eight-parted, turbinate.*

1. *ARNOPOGON DALECHAMPII* (great-flowered Sheepsbeard). Bot. mag. t. 1623. *Involucrum downy, unarmed; leaves runcinate, toothed.*—A hardy perennial; the leaves are six or seven inches long, and two broad, indented on their sides, and the flower-stalk arising immediately from the root is a foot in length, and supports one very large sulphur-coloured flower. A native of Spain, and the southern parts of France, growing especially about Montpellier. Flowering from June to October. Introduced 1739.

2. *ARNOPOGON PICROIDES* (prickly capped Sheepsbeard). *Involucrum hispid, aculeate; leaves runcinate, toothletted; cauline dilated at base.*—Curious cultivators have often raised this plant in England, where it proves a hardy annual, but it is too much like a common sow thistle to be much cherished. The herb varies in luxuriance and roughness but is not at

all hoary. The flowers are bright yellow, not half the size of the former, long, terminal, solitary, bristly stalks. Native of the south of France, the shores of Italy, Crete, &c. Flowering in July and August. Introduced 1683.

3. *ARNOPOGON ASPER* (rough Sheep-beard). *Involucrum hispid, aculeate; leaves entire; cauline oblong, attenuated at base.*—Annual, with the habit and flowers of the last, but the leaves are very different, at least those of the stem, which, instead of being dilated and deeply jagged, are merely oblong and toothed. Found on the shores of Montpelier, and Asia Minor. Flowering in July. Introduced 1774.

4. *ARNOPOGON CAPENSIS* (cape Sheepbeard). *Leaves runcinate, toothed; the upper ones arrow-shaped at the base, nearly entire.*—The seeds were sent to Jacquin from the Cape, and produced biennial plants, three or four feet high, branched, having much the appearance of a sow thistle; but the leaves are much less dilated at the base. Flowers in August. Introduced 1824.

CULTURE.—They thrive well in common soil, and are readily increased by cuttings.

ARNOSERIS.

Class Syngenesia Polygamia Æqualis. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle naked; corolla very obtuse and toothed; down simple, or imperceptible.*

1. *ARNOSERIS FETIDA* (stinking Arnoseris). *Scapes one-flowered; leaves pinnatifid; seeds naked.*—The whole plant has a disagreeable smell. It has much resemblance to Dandelion, but the flower is smaller, and of a deeper yellow colour. A native of the mountains of Italy, Dauphiny, Carniola, and Switzerland. Flowering in July. Introduced 1722.

2. *ARNOSERIS MINIMA* (least Arnoseris). Eng. Bot. t. 95. *Stem divided, naked; peduncle thickened.*—Like all field plants it varies extremely as to luxuriance, in its most abject state producing one simple solitary stalk with a single flower, while in a more favourable soil it sometimes bears six or more branched stems, many flowers, and leaves proportionably numerous and large. The root is annual, but little branched; leaves spreading on the ground. The flowers are solitary at the end of each subdivision of the stem,

small, erect, bright yellow. It flowers in May and June.

CULTURE.—May easily be propagated from seeds, either sown in the spring, or left to scatter of themselves. They mostly require a dry soil.

ARONIA.

Class Icosandria di-Pentagynia. Nat. Ord. *Pomacæa*.

The Characters are—*Petals spreading, unguiculate, with the leaves concave; styles 2-5; pome globose; leaves simple, bearing glands along the rachis on the upper side; flowers corymbose; peduncles branched.*

1. *ARONIA ARBUTIFOLIA* (red-berried Aronia). Mill. f. t. 109. *Unarmed; leaves lanceolate, crenate, tomentose underneath.*—This seldom rises more than five or six feet in Virginia, where it grows naturally in moist woods. The branches are few, slender, and upright. Leaves alternate, pale green above, ash-coloured underneath. The flowers are produced in small bunches, on long peduncles, at the sides and extremities of the branches. It varies with red, black, and white fruit. It flowers in May, and the fruit ripens in October. Introduced 1700.

2. *ARONIA FLORIBUNDA* (many-flowered Aronia). Bot. reg. t. 1006. *The leaves obovate, lanceolate, finely crenulate, smooth above, with a glandular costa, the younger obtuse, densely downy beneath, the old ones pubescent beneath, and tapering to a point.*—A hardy shrub with the full-grown branches reclinate, cinerous and smooth, the young ones downy. It forms a dense bush, which in the spring is covered with a profusion of white flowers, elegantly set off by the rosy red of their unburst anthers; and in the autumn rendered scarcely less an object of ornament by the clusters of dark blackish-purple berries with which its branches are loaded. A native of North America. Introduced 1826.

3. *ARONIA GRANDIFOLIA* (large-leaved Aronia). Bot. reg. t. 1154. *The leaves large, bright green, broad, oblong, abruptly acuminate, smooth on each side, shining above, serrulate, with few glands.*—A very handsome hardy shrub, resembling *A. Chama-mespilus* in the general appearance of its foliage, but far more beautiful than that species. It grows to the height of four or five feet, and is quite hardy, expanding its

blossoms about the middle of May. It is the most valuable of all the species hitherto described. Flowers white, fruit dark purple. It is a native of North America, but not noticed by any botanists of that country. Introduced 1825.

4. *ARONIA CHAMÆ-MESPILUS* (bastard Quince). *Unarmed; leaves oval, acutely serrated, smooth, simple, glandless; flowers corymbose, capitate.*—This shrub has a smooth stalk, about four or five feet high; sending out slender branches covered with a purplish bark. Leaves about two inches long, and one and a half broad, yellowish green on both sides, on long slender footstalks. The flowers are axillary, four or five together in a close head, purplish; with long narrow purplish bractes. The fruit is small, round, and of a red colour. A native of the Pyrenees, the mountains of Austria, &c. Introduced 1683.

CULTURE.—All the species are hardy enough to thrive in the open air in England, and some of them are very ornamental. They grow well in any soil or situation. The seeds do not vegetate till the second year after being sown. All the sorts of *Aronia* will take, by budding or grafting upon each other; they will also take upon the Quince or Pear stocks.

ARTABOTRYS.

Class Polyandria Plogynia. Nat. Ord. *Anonaceæ*.

The Characters are—*Calyx three-parted; petals six; stamen hypogynous; ovaries distinct, two-seeded; berries two-seeded; seeds collateral, erect, without arillus.*

ARTABOTRYS ODORATISSIMUS (sweet-scented Artabotrys). Bot. reg. 423. *Leaves oblong, lanceolate, acuminate, smooth, shining.*—This shrub is a native of China and the East Indies. It is cultivated as an ornamental covering for walls, as well as on account of the fragrance of the blossom, diffusing an odour like that proceeding from the finer kinds of ripe fruits. Its fragrance makes it peculiarly desirable for the stove. It flowers in June and July. Introduced 1758. Sweet says, "A rich sandy loam, and a little peat mixed with it, is the best soil to grow it in; and ripened cuttings, taken off at a joint, root readily in sand under a hand-glass, in heat."

ARTEDIA (named by Linnæus in honour of P. Artedi, a Swedish naturalist;

he was one of the first to divide umbelliferous plants into genera. His method was followed by Linnæus. He died in 1735).

Class Pentandria Digynia. Nat. Ord. *Umbellifereæ*.

The Characters are—*Fruit oblong, compressed, with the marginal wings sinuated; five dorsal ribs, and scaly juncture; flowers radiant; involucre pinnatifid.*

ARTEDIA SQUAMATA (fennel-leaved Artedia). *Seeds scaly.*—This is a native of the east. Rauwolf found it on mount Libanus; and Tournefort afterwards in Natolia. It is an annual plant, whose stalks rise about two feet high, sending out a few side branches, with linear multifid leaves, resembling those of Dill; the extremity of the stalk is terminated by a large umbel of white flowers.

It flowers in July, and was introduced in 1788, by Monsieur Thouin.

CULTURE.—This plant decays as soon as the seeds are perfected, and many times in England before they are ripe; for unless they are sown in autumn, and the plants come up before winter, they rarely produce good seeds here. They should be sown on a warm border, where the plants are to remain, for they will not bear transplanting. All the care they require is to keep them clean from weeds, and to thin the plants to six or eight inches distance; but to secure their seeding here they should be raised in a hot-bed, and kept in the greenhouse.

ARTEMISIA.

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Involucrum ovate, or rounded, imbricate; receptacle naked (or downy, Sm.); florets of the ray subulate; pericarps crowned with a membranaceous pappus.*

1. *ARTEMISIA JUDAICA* (Judean Wormwood). *Leaves obovate, blunt, lobed, small; flowers panicled, stalked.*—The stem is suffruticose, a foot and a half high, subpubescent, ash-coloured; panicle racemed; flowers roundish, rather depressed, the size of coriander seeds. Flowering in August. It has a bitter taste. Both leaves and seeds are used in medicine in the eastern countries, and are reputed to be tonic, stomachic, and anthelmintic.

Native of Caramania, the Mogul country, China, Judea, Arabia, &c. Rauwolf found it about Bethlehem, and Shaw in Arabia and the deserts of Numidia, plentifully. Introduced 1688.

2. *ARTEMISIA ABROTANUM* (Southern wood). Blackw. t. 535. *Stem upright; lower leaves bipinnate; upper pinnated, capillary; involucre downy, hemispherical.*—This species of *Artemisia* is a well-known perennial under-shrub, and is a native of Syria, China, Siberia, Italy, Carniola, and Montpellier. In England it was cultivated by Gerard in 1596, and probably much earlier. Although it sustains no injury from our ordinary winters, it seldom flowers.

The root is woody and fibrous. The stem rises two or three feet in height; is branching, and covered with an ash-grey bark. The leaves are alternate, doubly and irregularly pinnate, and stand upon long footstalks. The leaflets are linear, very narrow, entire, concave on the upper surface, concave below; tomentose, and of a pale green colour. The flowers, which are in close upright spikes at the extremities of the branches, are small, numerous, and of a pale yellow colour. The seeds are naked and solitary.

Qualities.—The herb, which is the part used in medicine, is exceedingly grateful in odour to most persons, and there are few cottage-gardens in which it is not to be found. The taste is pungent, bitter, and somewhat nauseous; it depends on an essential oil, and a small portion of resinous matter, soluble in proof spirits; the tincture thus formed is of a fine green colour, and contains the active properties of the plant in an eminent degree. The infusion is of a pale brown colour, possesses a slight bitter taste, strikes a black colour with the sulphate of iron, and precipitates the acetate of lead. Six pounds of the fresh tops yield about a drachm of essential oil, of a bright yellow colour, and an odour resembling that of the plant.

Southernwood agrees in its *medical* properties with the other species of *Artemisia*, but is more disagreeable; and as it possesses no advantages over either the common or the sea wormwoods, it is never employed in modern practice. A decoction of the herb was formerly employed externally in fomen-

tations; it has also been used under the form of ointment and lotion for some cutaneous eruptions, and for preventing the hair from falling off. In the days of Gerard, Southernwood was highly extolled in a variety of diseases, and the following extract from his *Herbal* will at least afford amusement:—"The top flowers, or seed, boiled or stamped raw with water and drank, helpeth them that cannot take their breath without holding their necks straight up, and is a remedie for the crampe, and for a newes shrunk and drawne together for the sciatica also, and for them that can hardly make water, and it is good to bring down the termes. It killen wormes and driveth them out; if it be drunke with wine, it is a remedie against deadly poisons. Also it helpeth against the stinging of scorpions and becke spiders, but it hurteth the stomack. Stamped and mixed with oyle, it taketh away the shiuering cold that cometh by the ague fits, and it heateth the body if it be anointed therewith before the fits do come. It is good for inflammations of the eies, with the pulpe of a roasted Quince, or with crums of bread, and applied pultis-wise. The ashes of burnt Southernwood with some kind of oyle that is of thinner parts, as of *Palma Christi*, Radish oyle, oyle of sweet Marierome, or organic, cureth the pilling of the haire, and maketh the beard to grow quickly; being strowed about the bed, or a fume made of it vpon hot members, it driveth away serpents; but if a branch be laid vnder the bed's head, they say that it prouoketh venere. The seeds of Southernwood made into powder, or boiled in wine and drunke, is good against the difficultie and stopping of vrine; it expelleth, wasteth, consumeth, and digesteth all colde humours, tough slime, and flegme, which do usually stop the spleene, kidneys, and bladder. Southernwood drunke in wine is good against all venome and poison. The leaves of Southernwood boiled in water vntill they be soft, and stamped with barley and barrowes grease vnto the forme of a plaister, dissolueth and wasteth all colde humours and swellings, being applied or laide thereto."

Common Southernwood is propagated by slips and cuttings, planted in a shady border the beginning of April observing to water them duly in dry

weather; here they may remain till the autumn, when they should be transplanted, either into pots or those parts of the garden where they are to remain.

3. *ARTEMISIA ARBORESCENS* (tree Wormwood). Lob. ic. 753. *Leaves tri-pinnatifid, silky, cinereous; leaflets linear; heads globose; flowers branched, simple*.—It grows naturally near the sea, in Italy and the Levant, and rises with a woody stalk six or seven feet high, sending out many ligneous branches, garnished with leaves somewhat like those of the common Wormwood, but more finely divided, and much whiter. The branches are terminated by spikes of globular flowers in the autumn, which are seldom succeeded by seeds here. Introduced 1641. This plant is easily propagated by cuttings, which, if planted in a shady border during the summer season, and duly watered, take root freely. In autumn some of the young plants should be potted, that they may be sheltered in winter; the others may be planted in a warm border, where they will live provided the winter proves favourable.

4. *ARTEMISIA ARGENTEA* (silvery Wormwood). *The leaves bipinnatifid, silky, white; leaflets lanceolate, linear; heads globose; flowers branched, virgate*.—The whole plant is of a silvery colour. The receptacle is villous. It is a native of Madeira, where it was found by Masson. It was introduced here in 1777, and flowers in June and July.

5. *ARTEMISIA PAUCIFLORA* (few-flowered Wormwood). *Cauline; leaves pinnated or trifid, filiform, pubescent; stem ascending, somewhat divided*.—Shrubby. Native of Siberia, flowering in June and July. Introduced 1824.

6. *ARTEMISIA GLACIALIS* (silky Wormwood). Jacq. t. 65. *Stem quite simple; leaves all palmate, multifid, white; heads terminal, clustered*.—It grows naturally on the Alps, is a low plant, seldom rising more than a foot and a half high; the stalks are closely garnished with very white leaves shaped like a hand; the flowers are globular, and produced in clusters at the extremity of the stalk; these are rarely succeeded by seeds in England. It flowers in June and July, and was cultivated by Mr. Miller in 1748. This plant may be propagated by planting

the side shoots in a shady border during any of the summer months, which, if duly watered, will put out roots, and in autumn they may be transplanted where they are to remain.

7. *ARTEMISIA RUPESTRIS* (stone Wormwood). All. ped. t. 9. f. 1. *Leaves pinnate; stems ascending; flowers globose, nodding; receptacle pappose*.—Grows naturally on the Alps; is a low under-shrub, seldom rising more than a foot high, sending out several slender branches, garnished with very white winged leaves, for which the plants are sometimes admitted into gardens. It flowers in August, and was cultivated by Mr. Miller in 1748. It is very hardy, and may be easily propagated by cuttings in the spring.

8. *ARTEMISIA SPICATA* (spiked Wormwood). *Stem quite simple; leaves hoary; radical palmate, multifid; cauline pinnatifid; upper linear entire, blunt*.—A native of the Alps, of Switzerland, Austria, Piedmont, and Dauphiny. This and the two preceding species of Wormwood are in great request among the inhabitants of the Alps, under the common name of *Genipi*, for restoring a suppressed perspiration, in pains of the side, and in intermitting fevers. They are an useful medicine in cases where strong diaphoretics are serviceable, as in the rheumatism, and in intermitting and cattarrhal fevers; but are dangerous in the pleurisy, though they are used indiscriminately by the peasants in all inflammatory disorders. Introduced 1790.

9. *ARTEMISIA PECTINATA* (comb-leaved Wormwood). *Stem quite simple; leaves pectinate, pinnatifid, glabrous; pinnae linear, filiform; peduncles one-flowered, axillary*.—This is an elegant and most fragrant plant, with an annual root, and an upright herbaceous stem, about eight inches high. It is easily known by its simply pinnate leaves; the pinna setaceous, parallel, pectinated, sometimes, but seldom, with a forked pinna; the flowers solitary from the axils along the stem. Found by Pallas, in the dry lands of Dauria. Introduced 1806.

10. *ARTEMISIA TANACETIFOLIA* (tanyleaved Wormwood). *Stem quite simple; leaves bipinnatifid, subpubescent, beneath; segments linear, lanceolate, acuminate, entire; raceme naked, terminal*.—It is an herbaceous plant, whose stalks

die to the root in winter, and fresh shoots arise in the spring, which are garnished with winged leaves, woolly on their under side; the flowers are produced on single spikes, which are rarely succeeded by seeds in England. In high situations it is sometimes entirely tomentose. A perennial, native of Dauphiny, Piedmont, and Siberia; flowering in July and August. Introduced 1768. It may be easily propagated by parting the roots in the autumn.

11. *ARTEMISIA SANTONICA* (Tartarian Wormwood). Gmel. 2. t. 51. *Cauline; leaves pinnated, linear, smooth; branches undivided; spikes one-sided, reflexed.* This species of *Artemisia* is a native of Tartary and Persia, and is reported to have been cultivated in England by Miller, in 1768. It flowers from September till November.

The root is perennial and woody. The stem is two feet high or more, round, panicled, erect, and somewhat hoary. The leaves on the upper part of the stem and branches are small, sessile, linear, entire, and undivided; the lower ones pinnate, much cut, linear, of a pale green colour above, and hoary beneath. The flowers are roundish, pale brown, solitary, and placed in alternate spikes or racemes upon short footstalks, and are all directed the same way. In the fruiting plant the branches are erect, and lose their hoariness. The common calyx is composed of numerous narrow imbricated scales. The florets of the disc are hermaphrodite; those of the radius female; and both, in their situation and structure, agree with the preceding species. The receptacle is naked.

A. santonica very much resembles common Wormwood in its chemical and sensible qualities. It has a strong disagreeable odour, and, when chewed, first warms the tongue, and then leaves a sensation of cold. The seeds both of this and the *A. Judaica* are brought from the Levant, and sold under the name of *worm seed*. They are reckoned a good balsamic, tonic, stomachic medicine. The seeds of this plant, known by the name of *Semina Santonica*, were formerly much used for the expulsion of worms, but have given place to anthelmintics more deserving of notice.

This may be propagated by slips or cuttings, planted in a dry soil and shel-

tered situation, where they will endure the colds of our ordinary winters pretty well: but it will be proper to have a plant or two in pots, which may be sheltered in winter under a common hot-bed frame, to preserve the species.

12. *ARTEMISIA CAMPESTRIS* (field Southernwood). Eng. bot. t. 338. *Caulis; leaves pinnated, setaceous, smooth; radical pinnated, with three-fid hoary segments; segments procumbent, branched virgate.*—This plant approaches next to common garden Southernwood, but that it has strong woody branches, which grow erect, and are of longer duration. It has also the same qualities, but in a much lesser degree. Linnaeus recommends an infusion of it in the pleurisy.

It grows on open dry heaths, and by road sides, in most parts of Europe. With us at Elvedon or Elden, in Suffolk, between Newmarket and Lynn; also near Barton-mills and Thetford; flowering in August. Our old authors call it wild Southernwood, and Ray fan-leaved Maywort.

13. *ARTEMISIA PALUSTRIS* (marsh Southernwood). Gmel. 2. t. 55. *Cauline leaves pinnated, smooth; pinnæ alternate, remote, very long; heads globose, erect, sessile.*—The flowers are yellow; receptacle naked. A native of Siberia, flowering in July and August. Introduced 1804.

14. *ARTEMISIA CRITHMIFOLIA* (sapphire-leaved Southernwood). *Cauline leaves pinnated, smooth, somewhat fleshy; pinnæ simple or bifid, linear, blunt; heads oblong, stalked, erect.*—This has the habits and flowers of field Southernwood; the stems from half a foot to a foot in height. It flowers from August to October. Found by Loesling on the sandy shores of Portugal. Cultivated by Mr. Miller in 1739.

15. *ARTEMISIA MARITIMA* (drooping flowered Wormwood). Eng. Bot. t. 1706. *Leaves downy, pinnated; the uppermost undivided; racemes drooping; receptacle naked; flowers oblong, sessile.*—This is a native plant, growing on the seashore, or about the mouths of large rivers, and flowering in August and September. We have observed it growing plentifully by the side of the Thames, near Greenhithe, Kent.

The root is perennial, and rather woody; the stems a foot high, or more;

solid, woody, erect, or decumbent; alternately branched, leafy, and covered with a fine white cottony down. The whole herb is hoary. The flowers are of a yellowish brown colour.

It has a more agreeable aromatic odour, and less bitter taste than common wormwood; its specific virtue being supposed to depend on a portion of resinous matter, and an essential oil. Its medical properties are those of a slight tonic, inferior in efficacy to common wormwood, and is occasionally prescribed in worm cases, dyspepsia, and jaundice.

All the authors we have consulted from Dioscorides down to Gerard, notice that cattle, and particularly sheep that feed near the coast where the sea-wormwood (*Maritima*) grows, fatten very rapidly; and as we all know, that the feeding on savoury herbs gives a relish to the flesh of animals, it is worthy the trial of those who feed flocks on the coast to sow a plot with this hardy plant.

It may be raised upon any soil, either by seeds or slips planted in March; and it is a singular fact, that if it be eaten by hogs, when the seeds are ripe, the seeds passing through their bodies germinate, and come up quickly, and will soon over-run the ground where the manure is spread.

16. *ARTEMISIA GALLICA* (upright flowered Wormwood). Eng. bot. t. 1001. *Leaves downy, pinnate, the uppermost undivided; clusters erect; receptacle naked; flowers oblong, sessile.*—The whole plant is clothed with a grey cottony down. The root is woody and perennial. It is distinguished from *A. maritima* in having upright flowers. This plant has the qualities of the common Wormwood, but is less bitter, and more agreeable in its flavour. It is not uncommon in muddy places about the sea coast, in this country, flowering in August and September.

17. *ARTEMISIA PONTICA* (Roman Wormwood). Jacq. a. t. 90. *Leaves downy beneath; cauline bipinnate; leaflets linear; heads roundish, stalked, nodding.*—This is a low herbaceous plant, whose stalks die to the root in autumn, and new ones arise in the spring. The flowers appear in August, but are rarely succeeded by seeds in England.

The bitterness of this plant is so

mixed with a kind of aromatic flavour, as scarcely to be disagreeable; and it appears to be more eligible than either common or sea Wormwood, as a stomachic and corroborant; for which purpose a conserve of the top has been greatly recommended, and is, undoubtedly, an elegant and useful preparation.

It will grow in any moderately moist soil, and may be propagated by parting its creeping roots in the middle of October, and planting them two or three feet asunder.

18. *ARTEMISIA ANNUA* (annual Wormwood). *Leaves smooth, triply pinnatifid; stems straight; heads roundish, subsessile, erect.*—It is an annual plant which grows two feet high, garnished with smooth winged leaves, which have an agreeable scent; the flowers are globular, and nod on one side; flowering in July and August. A native of Siberia. Introduced 1741. If the seeds of this are permitted to scatter in the autumn, the plants will come up better than if sown with care.

19. *ARTEMISIA BIENIA* (biennial Wormwood). Bot. mag. t. 2472. *Leaves smooth; radical triplex pinnate; upper undivided linear; heads roundish, subsessile erect.*—A hardy biennial, raised in the garden belonging to the Horticultural Society, from seeds collected by Dr. Richardson, on his journey to the Coppermine river, during the fatal expedition under Captain Franklin, and presented by him to the Society. It is a plant of no particular beauty. Flowering in October.

20. *ARTEMISIA ABSINTHIUM* (common Wormwood). Eng. bot. t. 1230. *The leaves bi-tripinnate, clothed with short, silky down; segments lanceolate; heads hemispherical, drooping; receptacle downy.*—Wormwood which derived its English name from the virtue it possesses of destroying worms, grows in the midst of almost every English village, particularly where the soil is chalky or gravelly. There, on many a rugged dusty green, where the whipping-post and stocks, with their appropriate distich,

“Fear God and honour the King,
Or else they will you into me bring,”

are, as Shakespear says, *Wormwood* to the idle and disorderly, this herb is sure to be met with. It is perennial and flowers in August.

This plant, which Dr. Thompson justly observes, is the only species of *Artemisia* that deserves to be retained in the list of *Materia Medica*, is remarkable for its intense bitterness, united to a peculiar strong aromatic odour.

The stems form tufts about a foot high, and are furrowed, branched, and leafy. The whole plant is of a pale whitish green, and clothed with short or close-pressed silky down. Clusters of flowers are collected into a leafy panicle. Each flower is broad and hemispherical, and of a yellow colour, and accompanied by entire, oblong bractes. The seeds are small, obovate, and naked.

In the neighbourhood of London it is extensively cultivated for medical use, but wild specimens are more powerful than garden ones. At Mitcham, in Surrey, it is a good deal cultivated for the seed, which is sold to the rectifiers of British spirits; and in Scotland, the distillers of great-still whiskey sometimes employ it in place of hops, and for their use small fields of it are occasionally sown.

Tusser notices the use made of this aromatic bitter, in days of less refinement than the present.

"While Wormwood bath seed, get a handful or twain,

To save against March, to make flea to refrain:

Where chambers is sweeped, and Wormwood is strown,

No flea for his life, dare abide to be known.

What savor is better, if physick be true,

For places infected, than Wormwood and rue;

It is a comfort for hart and the braine,
And therefore to have it, it is not in vaine."

Medical Properties and Uses.—Wormwood is one of the most popular stomachics, and possesses the properties of the class of bitters in a considerable degree; but it is inferior in medicinal powers to gentian, chamomile, quassia, and many others. It is regarded as anthelmintic, slightly tonic, and in an inconsiderable degree diuretic. Wormwood has a strong fragrant odour, and an intensely bitter, nauseous taste. These qualities are most remarkable in the fresh leaves, which lose part of their disagreeable smell by drying. The flowers are nearly as bitter as the leaves, but less nauseous; the roots are warm and aromatic, without the bitterness of

the other parts of the plant. The leaves and flowering tops are the parts directed for medical purposes; and their peculiar virtues may be extracted either by water or by alcohol. Besides the resinous matter, in which the bitter quality more immediately resides, the herb contains extractive, some earthy and saline matters, and an essential oil, which is not in the least bitter. By long boiling the essential oil is dissipated, and the bitter is obtained entire. An infusion of the herb gives to water an olive tinge, which is slowly turned to black by salts of iron; and superacetate of lead throws down a yellowish-green flocculent precipitate. Like all other bitters it has been of service in calculous complaints, and is an ingredient in the once celebrated Portland powder for the cure of gout.

Its efficaciousness has been proved in crowded theatres and stage coaches: and great refreshment has been experienced from the smell of common wormwood.

A gentleman at the bar, to whom we recommended it, tells us that he has experienced its reviving qualities in heated courts, as being nearly equal to a change of air.

The French distil this herb, from which they make a *liqueur* that is greatly admired in that country, where we observed that the lower classes preferred it of a grass-green colour. It is to be feared that this colouring would injure as much as the herb would benefit the body.

The oil of wormwood being rubbed on furniture, prevents, it is said, the worm from injuring it, and likewise keeps off all kinds of flies and insects; on this account, the herb was formerly put into clothes-presses, and wardrobes of woollen garments.

Wormwood was in great use before the hop had acquired so much celebrity in the composition of beer. When properly managed, Wormwood has been found to give a flavour to malt liquor, which many have preferred to that given in the common way by hops.

For this purpose the plant should be gathered when fully ripe, and the seeds upon it, and in this state hung up in small bunches to dry. When thoroughly dried, a certain quantity of good strong malt liquor is to be impregnated with it.

This is to be set by for use, to add to beer when brewed, agreeably to the taste, or the time it is required to be kept.

The wormwood for this purpose should have its seeds carefully preserved in the drying, and it is best when not used till three years after it is gathered.

It is easily propagated by parting the roots, by slips, or by seeds, sown in the autumn, soon after they are ripe; or if they be permitted to scatter, the plants will come up without further care.

21. *ARTEMISIA VULGARIS* (Common Mugwort.) Eng. bot. t. 918. *Leaves pinnatifid; their segments cut, downy beneath; Heads somewhat racemed, ovate; Receptacle naked.*—Mugwort is found wild over the greater part of Europe, China, Japan, &c. on the borders of fields, and ditch banks, by waysides, in waste places, and about farmyards. It flowers with us in August and September.

Mugwort has been chiefly recommended for promoting the uterine evacuations, and abating hysteric spasms; for which purposes, infusions of it has been drank as tea, and used as a bath. It appears to be one of the mildest of the substances used in such intentions, and may perhaps be of service where medicines of more activity would be improper. The flowery tops are considerably stronger than the leaves.

In some countries it is used as a culinary aromatic. A decoction of it is taken by the common people to cure the ague. A drachm of the leaves powdered was given four times a day by Dr. Home, to a woman who had been affected with hysteric fits for many years. The fits ceased in a few days. In this patient assafoetida and ether had been given to no purpose.

Thunberg informs us that the *Moxa* is prepared in Japan from this species. The leaves are collected in June, dried in the shade, and beat in a mortar till they become like tow; this substance is then rubbed between the hands, till the harder fibres and membranes are separated, and their remains nothing but a very fine cotton. The Japanese use it for tinder; and twice in a year men and women, young and old, rich and poor are indiscriminately burnt with it, either to prevent disorders, or to cure the rheumatism, &c.

No quadruped seems to feed on this plant.

There are several varieties of Mugwort, some with red stalks, with white stalks, with sulphur-coloured flowers, and with variegated leaves.

This species of wormwood was formerly called *Cingulum sancti Johannis*, because it was foolishly imagined, that if a crown was made of this herb, and worn upon the eve of St. John, and then thrown into the fire, while mumbling some unintelligible verses, it would secure the person from spectres, diseases, and misfortunes, for the following year.

It was generally called *Zena Divi Johannis*—St. John's Girdle—by inmates of monasteries, who believed that St. John the Baptist wore a girdle of it when he was in the wilderness; in those superstitious times it was said that the Devil could do no harm to those who had mugwort in their houses; and that placing a piece of this herb over the door, would secure the house from all unlucky accidents. If hung up in the entry or hall of a house, it was thought to banish all witches; but as old hags have ceased to exert any influence over man, and he shows no desire to disentangle himself from the enchantment of young and beautiful sorceresses, this herb is no longer seen in our halls.

Mugwort, being so common a plant, wild, is rarely admitted into gardens, except the variegated sort: this may be raised by slips, cutting or parting of the root.

22. *ARTEMISIA CÆRULESCENS* (blueish Mugwort). Eng. bot. t. 2426. *Leaves hoary, lanceolate, entire; radical cut; floral oblong, stalked, nodding.*—Its glaucous hoary hue, leaves for the most part simple, lanceolate bluntish and entire of a considerable breadth, the lowermost only being lobed or pinnatifid, strongly mark the species. The flowers are abundant in August and September, and stand erect. The receptacle is naked and very minute; Gerard says it grows in the isle of Wight, yet no botanist has recently found it in Britain. It is not uncommon on the sea shores of the milder climates of Europe.

23. *ARTEMISIA DRACUNCULUS* (Taragon). *Leaves smooth, lanceolate, narrowed at each end; heads roundish,*

stalked erect.—Tarragon is said to have been so called on account of its tortuous roots, which may be likened to the sinuous tail of a dragon; but it is much more probable that the word is a corruption of *Tarchon*, the Arabic name of the plant. It is of moderate growth, rising in branchy stalks and small narrow leaves.

The leaves and points of the shoots are used as an ingredient in pickles. A simple infusion of the plant in vinegar makes a pleasant fish sauce; it is eaten along with beef steaks, as horseradish is with roast beef; and is employed, both in Europe and Persia, to correct the coldness of salad herbs, and season soups and other compositions. The plant is of the easiest culture, but like other species of the genus, dislikes a wet soil. It may be propagated in the spring, by seed; or, more expeditiously in summer, from June to August, by slips or cuttings of the spring stalks or branch shoots; the genus should be planted in beds or borders from six to nine inches apart, and properly watered. They will quickly increase in a branchy head, for use the same year, to gather green as wanted; and a portion may be dried and housed for winter.

To obtain Tarragon in winter.—Plant some stocky roots in a hot-bed, or in pots placed in a hot-house.

24. ARTEMISIA CHINENSIS (Moxa) *Leaves hoary; lower cuneiform, obtuse, three-lobed; upper linear, blunt, flowers globose stalked, cernuous*.—The stem is herbaceous, simple, two feet and a half high, straight thick, white, with abundance of cotton. The flower is small, pale, on terminating upright racemes. The plant is inodorous and insipid.

This is the species from which the *Moxa* is prepared in China, from the acrid leaves dried and beaten. In Cochinchina and Japan, the common mugwort is used for this purpose, and is more efficacious than the Chinese sort. *Moxa* is celebrated in the east, for preventing and curing many disorders, by being burnt on the skin: it produces a dark-coloured spot, the exulceration of which is promoted by applying a little garlic, and the ulcer is either healed up when the eschar separates, or kept running, as circumstances require. A fungous substance, found

in the fissures of old birch trees is used by the Laplanders for the same purpose; and cotton impregnated with a solution of nitre, and then dried, will answer the end as well as the *Moxa*. All these applications are only means of producing an exulceration of the skin, and its consequence, a drain of humours.

The Chinese call it the Physician's herb, and employ it in hæmorrhages, dysenteries, pleurisies, and disorders of the stomach; girdles of the down are recommended in the sciatica, and those who are afflicted with the rheumatism in their legs quilt their stockings with it. A native of China. Introduced 1816.

Culture.—Most of the plants of this numerous genus, containing more than one hundred species, are hardy perennials, and may be increased without much difficulty by seeds, parting the roots, slips or cuttings. A few that are natives of very warm climates, and of course rather tender, must be placed in a green house, with a large share of air, in mild weather, when they should be frequently watered. They love a light fresh soil, and may be propagated by slips, or cuttings. In general they will succeed in a shady border defended from the frost. Several of the species are neat little plants, very ornamental for rock work, or to be grown in small pots, as they take up but little room, and their silvery leaves make a pretty appearance.

ARTHROPODIUM.

Class Hexandria Monogynia. Nat. Ord. *Asphodeleæ*.

The Characters are—*Sepals six, spreading; the three inner wavy at the edge or fringed; filaments bearded; capsule nearly round*.

1. ARTHROPODIUM PANICULATUM (panicked Arthropodium). Bot. mag. t. 1521. *Racemes divided; peduncles clustered; inner sepals crenulate; capsules pendulous*.—This elegant species is a native of New South Wales, and is now to be seen in many greenhouses, and flowering in many summer months. The root is perennial; stem erect, round, three or four feet high; slightly leafy in the lower part: much branched and panicked above. Leaves a foot and more in length, chiefly radical; flowers drooping, three or four together, on undivided partial stalks. The corolla is reflexed,

half an inch in diameter, white, variegated with lilac, three outer segments small, acute; three inner ovate, elegantly crisped at the margin; beard of the stamens dense yellow. Anthers and stigma purple. It is generally kept in the greenhouse. Introduced 1800.

2. *ARTHROPODIUM CIRRATUM* (New Zealand Arthropodium). Bot. reg. t. 709. *Raceme divided; bractes leafy; the bearded half of filament with two appendages at base: leaves lanceolate, ensiform.*—This plant is a native of New Zealand, where it was discovered by Sir J. Banks and Dr. Solander, in their celebrated voyage with Captain Cook. It is readily distinguished from its congeners by several striking peculiarities, but most curiously by the two downy curled appendages that spring from the lowermost termination of the upper bearded portion of each of the filaments. The anthers are greenish, and coil themselves backwards, so as ultimately to form a complete circle. It flowers in May and June. Has been treated as a greenhouse plant, but Mr. Milne thinks it may prove hardy. Introduced 1819.

CULTURE.—The species of this genus will grow freely in an equal mixture of loam and peat, and may be increased by dividing at the root, or from seed.

ARTICHOKE see *Cynara*.

ARTOCARPUS.

Class Monœcia Monandria. Nat. Ord. *Urticææ*.

The Characters are—**MALE** *A cylindrical catkin; calyx 0; petals 2; filaments the length of the corolla.*—**FEMALE** *calyx 0; corolla 0; ovaries numerous, collected in a globe; style filiform; drupe compound.*

1. *ARTOCARPUS INCISA* (Bread fruit). Bot. mag. tab. 2869—71. *Leaves pinnatifid, sinuated, scabrous, downy beneath.*—A tree producing a fruit, which, without any preparation, has the appearance of, and is used as a substitute for bread, cannot fail to be an object of great curiosity; and from the time of DAMPIER who appears to have first made known the existence of such a plant to Europeans, it has been spoken of as one of the wonders of the vegetable creation: but much of its present celebrity is due to that deeply affecting history of the sufferings of Captain, afterwards Rear-admiral BLIGH, consequent upon the mutiny of the *Bounty*, the ship that was employed to convey

so valuable a fruit to our own colonies in the West Indies.

Dampier saw the fruit abundantly in the Ladrone Islands; he tells us "that the Bread-fruit grows on a large tree, as big and high as our largest trees. It hath a spreading head full of branches and dark leaves. The fruit grows on the boughs like apples: it is as big as a penny loaf, when wheat is at five shillings the bushel. It is of a round shape, and hath a thick tough rind. When the fruit is ripe it is yellow and soft, and the taste is sweet and pleasant. The natives of Guam use it for bread; they gather it when full grown, while it is green and hard; then they bake it in an oven, which scorches the rind and makes it black: but they scrape off the outside black crust, and there remains a tender thin crust, and the inside is soft, tender and white, like the crumb of a penny loaf. There is neither seed or stone in the inside, but all is of a pure substance like bread. It must be eaten new, for if it is kept above twenty-four hours it becomes dry and choaky, but it is very pleasant before it is too stale. This fruit lasts in season eight months in the year; during which time the natives eat no other sort of food of bread kind. I did never see this fruit any where but here; but the natives told us, that there is plenty of this fruit growing on the rest of the Ladrone Islands."

This account was published in 1697. Above forty years afterwards, Commodore Anson, in visiting the same country, speaks of it as being in size equal to a two-penny English loaf, from which we may infer that the price of bread had already risen considerably during that time. He compares the flavour of the *Bread-fruit*, when boiled and roasted, to that of the common potatoe; and further tells us, that "the Spaniards slice it, and expose it to the sun, and when brought thereby to a crispature, they reserve it as a biscuit, and say it will bear long keeping when so prepared. Eaten ripe it is delicious to the palate, and when mixed with lime or orange juice, it makes a grateful tart not unlike to apple sauce. It was eagerly sought for by the crew of the *Centurion*, and preferred by them to bread."

Rumphius remarks, that "the internal part of the rind consists of a fleshy substance, full of twisted fibres, which

have the appearance of fine wool; these adhere to and in some measure form it. The fleshy part becomes softer towards the middle, where there is a small cavity formed, without any nuts or seeds, except in one variety which has but a small number; and this sort is not good unless it be baked, or prepared some other way; but if the outward rind be taken off, and the fibrous flesh dried, and afterwards boiled with meat, as we do cabbage, it has then the taste of artichoke bottoms. The inhabitants of Amboina dress it in the liquor of cocoa-nuts; but they prefer it roasted on coals, till the outward part or peel is burnt; they afterwards cut it into pieces, and eat it with the milk of the cocoa-nut. Some people make fritters of it, or fry it in oil; and others, as the Sumatrans, dry the internal soft part, and keep it to use instead of bread with other food.

It affords a great deal of nourishment, and is very satisfying; and being of a gently astringent quality, is good for persons of a lax habit. It is more nourishing boiled with fat meat, than roasted on coals.

The milky juice, which distils from the trunk, boiled with cocoa-nut oil, makes a very strong bird-lime."

But it is in the South Sea Islands, and especially at Otaheite, that the best *Bread-fruit* is found, and where it is consequently most highly prized.

In Captain Cook's voyage it is observed, "that the Bread-fruit tree is about the size of a middling oak; its leaves are frequently a foot and half long, oblong, deeply sinuated, like those of the fig-tree, which they resemble in consistence and colour, and in exuding a milky juice when broken. The fruit is the size and shape of a child's head, and the surface is reticulated not much unlike a truffle: it is covered with a thin skin, and has a core about as big as the handle of a small knife; the eatable part lies between the skin and the core; it is as white as snow, and somewhat of the consistence of new bread. It must be roasted before it is eaten, being first divided into three or four parts: its taste is insipid, with a slight sweetness somewhat resembling the crumb of wheaten bread mixed with Jerusalem artichoke. This fruit not being in season at all times of the year, there is a method of supplying this defect, by reducing it to a sour

paste, called *Mahie*: and besides this, cocoa-nuts, bananas, plantains, and a great variety of other fruits come in aid to it. Three trees are supposed to yield sufficient nourishment for one person.

This tree is useful not only for food, but also for clothing; for the bark is stripped off the suckers, and formed into a kind of cloth.

To procure the fruit for food costs the inhabitants no trouble or labour but climbing a tree, which, though it should not indeed shoot up spontaneously, yet, as Captain Cook observes, "If a man plants ten trees in his life-time, he will as completely fulfil his duty to his own and future generations as the native of our less temperate climate can do by ploughing in the cold winter, and reaping in the summer's heat, as often as these seasons return; even if, after he has procured bread for his present household, he should convert a surplus into money, and lay it up for his children. But where the trees are once introduced in a favourable soil and climate, so far from being obliged to renew them by planting, it seems probable that the inhabitants will rather be under the necessity of preventing their progress; for young trees spring abundantly from the roots of the old ones, which run along near the surface. Accordingly they never plant the Bread-fruit tree at Otaheite."

The principal varieties of this tree are that in which the fruit is destitute of seeds, and that in which they are found. The latter may be considered as the tree in a wild state; and the want of seeds is probably owing to cultivation; as in the Barberry, and the little Grape of Zant, which we commonly call Currants. The natives of Otaheite reckon at least eight varieties of that without stones, differing in the form of the leaf and fruit. In Otaheite, however, and some others, the evident superiority of the seedless variety for food has caused the other to be neglected, and accordingly there it is almost or altogether worn out. Captain King informs us, that in the Sandwich Islands these trees are planted, and flourish with great luxuriance on rising grounds; that they are not indeed in such abundance, but that they produce double the quantity of fruit which they do on the rich plains of Otaheite; that the trees are nearly of the same height, but that the branches

egin to strike out from the trunk much power, and with greater luxuriance; and that the climate of these islands differs very little from that of the West-Indian islands, which lie in the same latitude, for on the whole, perhaps, may be rather more temperate.

It was this reflection, probably, which first suggested the idea of conveying his most useful tree from Otaheite to our islands in the West Indies.

His late Majesty, George the Third, ever anxious for the welfare of his people, appointed the Bounty to be freighted with this and other valuable productions of the South Seas, under the command of Captain William Bligh. The ship sailed on the 23rd of December, 1787, for Otaheite for this purpose; the preparations for executing the object of the voyage being completed according to a plan given by Sir J. Banks. 1015 healthy plants of the *Bread-fruit* were procured, and conveniently placed on board the vessel, so as to be protected from the spray of the sea, and there was every prospect of a happy termination to the voyage.

The fatal mutiny, which prevented the accomplishment of this benevolent purpose, and subjected the commander and his friends to the most unheard of hardships, together with the fate of the mutineers, and the good conduct and reformation of CHRISTIAN, is well known.

His Majesty however, not discouraged by the unfortunate event of this voyage, and fully impressed with the importance of securing so valuable an article of food as the Bread-fruit to our West-Indian islands, determined in the year 1791 to employ another ship on this business; and in order to secure the success of the voyage as much as possible, it was thought proper that two vessels should proceed together on this service. The charge was given to the same experienced navigator, who accomplished, to the fullest extent, the object of his mission. Eleven hundred and fifty one Bread-fruit trees were received on board. Many, as may be supposed, notwithstanding the care of the officers, and the skill of the gardener, perished during the voyage. Five hundred and fifty were landed at St. Vincents, in January, 1793, and placed under the judicious management of Dr. Anderson. The rest went to Jamaica,

with the exception of five plants, destined for the royal gardens at Kew. A fresh supply has been more than once received, and there are now a number of plants in the nurseries about London.

When landed at St. Vincents in 1793, they were from six inches to a foot high. In 1797 they had attained to the height of thirty feet and upwards, and the circumference of the stems from three to three and a half feet. It was feared, when they were first landed, that they would not have strength to stand against the violent hurricanes of the West Indies; but the wood is found, on the contrary, to be extremely tough and well qualified to resist the severest gusts of wind.

Captain Bligh had the satisfaction, before he quitted Jamaica, of seeing the trees which he had brought with so much success, in a most flourishing state; insomuch that no doubt remained of their growing well, and speedily producing fruit.

It is difficult, perhaps, to point out a more benevolent undertaking than this of transporting useful and salutary vegetables from one part of the earth to another where they do not exist. And every good man will certainly rejoice, that a humane and well-concerted plan has thus at length happily succeeded, and that the Bread-fruit tree, with many other fruits and plants, has been established in the West Indies by the kind attention of the British government.

How curious and interesting to the Botanist, is the migration of plants, which man in his travels exports from the most distant lands! The Bread-fruit is now known from Spanish Guiana to the kingdom of New Granada; thus, as HUMBOLDT states the curious fact, the western coast of America, washed by the Pacific Ocean, receives from a British settlement in the West Indies a production of the Friendly Islands.

It is not probable that its cultivation will ever supersede, valuable as it is, that of the *Plantain*, and its several varieties; which on the same space of ground, furnishes perhaps more nutritive matter, at least in a shorter period of time.—The *Bread-fruit*, according to Sweet, is generally supposed to be difficult of cultivation in this country. He considers that the plants have been, in

general, treated too tenderly, and not allowed sufficient air. "They appear," he says "to be of the same nature as the Fig, to which they are nearly allied. Large cutting root freely in a pot of sand, plunged under a hand-glass, in a moist heat, with all their leaves entire: if the leaves are shortened, it is a great chance if they succeed."

2. *ARTOCARPUS INTEGRIFOLIA* (Jack-tree, or entire-leaved Bread-fruit). Bot. mag, t. 2833. *Leaves obovate-oblong, four to six inches long, smooth above, rough with minute hair beneath.*—This highly interesting, and in this country rare plant, is a native of many parts of the continent, and of the islands in the East Indies, especially the Molucca islands, and according to *Roxburgh*, is cultivated very generally through the warmer regions of Asia, on account of the use that is made of the fruit and seeds. This curiously muricated fruit, which varies considerably in shape, is reckoned among the largest that is known, often weighing *seventy* or *eighty* pounds. The fleshy part of the fruit is eaten in the East Indies; but authors vary much in regard to the quality of it. The seeds, however, are allowed by all to be good, and even when roasted to have the taste of Chestnuts.

In Ceylon, where it attains the greatest size and perfection, it forms a considerable part of the diet of the natives at particular times of the year. The unripe fruit is also used pickled, or cut into slices and boiled, or fried in Palm oil.

The flowers have a sweet smell, and are produced, in the tropics, in the months of January and February. The fruit ripens in August and September. The wood is like mahogany in colour, when it has been for some time exposed to the air: and in some parts of India, is on that account employed to make furniture of. It is more commonly employed in building houses, for which it is well suited. From the juice or milk, a very viscid bird-lime is made.

The tree seems naturalized in the West Indies, particularly in the Island of St. Vincent. It was introduced there by the late Dr. Anderson. Into England the Jack-tree was introduced in 1778.

CULTURE.—Large cuttings root freely in a pot of sand, plunged under a hand-glass in a moist heat.

ARUM.

Class *Monœcia Polyandria*. Nat. Ord. *Aroideæ*.

The Characters are—*Spatha of one leaf convolute at the base; stem sessile, near the middle of the spadix, which is naked above.*

1. *ARUM CRINITUM* (hairy-sheathed Arum). Bot. reg. t. 831. *Leaves pedate, entire; spadix cylindrical, shorter than ovate, flat spathe which is hairy inside.*—A most remarkable plant in singularity of appearance, surpassing any of the same singular genus with which we are acquainted. It is a stemless plant, one and a half foot high, very rare in this country, and, we believe, has seldom produced its flower, which resembles the huge flapping ear of some monstrous animal. Flowers in March and April.

The flower smells strong of carrion, by which flies are enticed to enter, but when they would retreat, the reversed hairs prevent them, and they are starved there to death. A native of Minorca. Introduced 1777.

2. *ARUM DRACUNCULUS* (common-dragon Arum). Thornton's Ic. t. 22. *Leaves pedate entire; spadix lanceolate, shorter than the ovate, flat, smooth, spathe.*—Common Dragon has a large, tuberous, fleshy root, which in the spring puts up a straight stalk, about three feet high, spotted like the belly of a snake; at the top it spreads out into leaves, which are cut into several narrow segments almost to the bottom; at the top of the stalk the flower is produced, which is in shape like the common Arum, having a very long spathe of a dark purple colour, standing erect, with a large spadix of the same colour, so that when it is in flower it makes no unpleasing appearance; but the flower has so strong a scent of carrion that few persons can endure it; for which reason it has been banished most gardens; but were it not for this, a few of the plants might merit a place, for the odness of the flower.

Dr. Thornton observes:—"This extremely fœtid, poisonous plant will not admit of sober description. Let us, therefore, personify it:—

She comes peeping from her purple crest, with mischief fraught; from her green covert projects a horrid spear of darkest jet, which she brandishes aloft: issuing from her nostrils flies a noisome

pour, infecting the ambient air: her indred arms are interspersed with hite, as in the garments of the inquisition, and on her swollen trunk are observed the speckles of a mighty dragon; her sex is strangely intermixed with the opposite: confusion dire! all aimed for horror, or kind to warn the aveller that her fruits are poison-berries, grateful to the sight, but fatal to the taste. Such is the plan of Providence, and such Her wise resolves.

Thy soul's first hope! thy mother's sweetest joy!

Tender Laura, as she kiss'd her boy,
Oh, wander not where Dragon Arum shows
Her baleful dews, and twines her purple flowers,

Fast round thy neck she throws her snaring arms,

Up thy life's blood, and riot on thy charms.
Her shining berry, as the ruby bright,
Light please thy taste, and tempt thy eager sight.

Trust not this specious veil; beneath its guise,

A honey'd stream a fatal poison lies.
O Vice allures with Virtue's pleasing song,
And charms her victims with a Siren's tongue."

It grows naturally in most of the southern parts of Europe, and is preserved in gardens to supply the markets. Gerard cultivated it in 1596. It flowers in June and July.

It appears to be similar in medicinal virtues, as in botanical characters, to common Arum; it might be used, therefore, in the same cases, but general practice employs only the latter. So far as can be judged between substances of such vehement pungency, this is rather the strongest.

Common Dragon is very hardy, and will grow in any soil or situation. It propagates very fast by offsets from the roots. The time to transplant is in the autumn, when the leaves decay.

3. *ARUM DRACONTIUM* (green-dragon Arum). Bot. reg. t. 668. *Leaves pedate, entire; spadix subulate, longer than the oblong convolute spathe.*—Grows naturally in moist places in Virginia and New England, but it is very difficult to preserve long in a garden. I received some roots of this from New England a few years ago, which continued two years; but the soil being dry, they decayed in summer: these should have a moist shady situation, otherwise they will not thrive. The

leaves of this sort are divided like those of the Common Dragon (*A. Dracunculus*) but are smaller, and rarely grow more than nine inches high; the flowers are like those of the common Arum, or Cuckow-pint, but the pistil is longer than the spathe. It flowers in June, and the stalks decay in autumn." The root of this, as well as the former, is acrimonious and purgative; it is prescribed as a very strong emmenagogue. It is very seldom seen in this country, although it was known and cultivated by Miller, in the Chelsea garden, in 1759.

It should be potted in loam and peat, and placed in the shade, and may be sometimes increased by offsets.

4. *ARUM BULBIFERUM* (bulb-bearing Arum). Bot. mag. t. 2508. *Stemless; leaves decompose, bulbiferous; spadix oblong, ovate, shorter than the obtuse; veiny spathe.*—This magnificent species of *Arum*, is a native of Bengal, where it flowers in the wet season, and is called by the natives *Umber Bale*. The leaf is nearly three feet high, and spreads over an area of several square feet. Bulbs are formed always at the primary, and sometimes at all the divisions of the leaf, from whence the specific name is derived. Requires to be kept in the stove. Introduced 1813.

5. *ARUM VENOSUM* (purple-flowered Arum). Bot. reg. t. 1017. *Leaves pedate entire; spadix shorter than the lanceolate spathe.*—A tender stove plant—native of Brazil; of much beauty when in flower. It is propagated by offsets, which are sparingly produced. Flowers in March. Introduced 1774.

6. *ARUM TRIPHYLLUM* (three-leaved Arum). Bot. cab. t. 320. *Stemless; leaves ternate, entire; spadix clavate, shorter than ovate, acuminate, flat; stalked spathe.*—It grows naturally in Virginia and Carolina, from whence I have received it. The leaves arise immediately from the root, having scarce any foot-stalks; the flowers come up between the leaves. They appear in May, but have little beauty, so the plants are only kept in botanic gardens for the sake of variety. They will live in the open air, if they are planted in a sheltered situation, or if the surface of the ground is covered with tan, to keep out the frost in winter, and with thrive better in the full ground than in pots. They are propagated by offsets.

It was cultivated here in 1664, as appears by Mr. Evelyn's calendar, but does not appear to remain a great while in a cultivated state. The roots in general become gradually less and less till they quite perish. Messrs. Loddiges say the best mode to preserve them is in rich peat earth, kept pretty wet.

7. **ARUM COLOCASIA** (Egyptian Arum). *Stemless; leaves peltate, ovate, repand, emarginate at base.*—Egyptian Arum or Colocasias, has a tuberous, thick, large, oblong root, rounded at the base; leaves thick, smooth, ash-coloured, in form and size resembling those of the Water-lily, having thick ribs running obliquely to the edge. Petioles thick, upright, roundish, whitish, spreading out at bottom. Scape short, with a subulate, reflex, flat spathe. Spadix subulate, shorter than the spathe.

Native of the Levant, Egypt, Sicily, and Italy, near Palermo, where it is esteemed a wholesome food, and is frequently eaten in the east, though not very delicate. The roots and petioles are boiled, and the leaves, when young, are sometimes eaten raw.

It was cultivated in 1690, in the royal garden at Hampton-court.

The plants of this species are easily propagated by the offsets, which they put out plentifully from their roots: these must be planted in pots filled with light earth, and plunged into a hot-bed, to promote their taking root; and if they be afterwards continued in the bark stove they will make greater progress and produce longer leaves.

8. **ARUM ORIXENSE** (Orixian Arum). Bot. reg. t. 450. *Leaves hastate, three-parted; spathe stalked, two-coloured, longer than spadix, the end lanceolate and deflexed.*—It is a low-growing, herbaceous plant, having a bulbous root about the size of a large walnut. It possesses an acrid quality, and is said to be used by the natives of India as a cure for the bite of venomous reptiles.

It requires the stove heat, and may be increased by offsets from the root, which are pretty freely produced. The soil should be rich loam, and the plant likes plenty of water. Introduced 1802.

9. **ARUM TRILOBATUM** (three-lobed Arum). Bot. mag. t. 339. *Stemless; leaves sagittate, three-lobed; flowers sessile.*—It is one of the least of the tribe, its root is like that of the com-

mon Arum, and extremely acrid; but the plant is more particularly distinguished by the rich brown, velvety appearance of its flowers, the length of its tapering spadix, which on its lower part is full of little cavities, and resembles a piece of metal corroded by long exposure, and by the intolerable stench which the whole of the flower, but more especially the spadix, sends forth.

Native of Ceylon, Amboyna, Japan, and Cochinchina. It flowers here in May and June, and is propagated by offsets, which come out in abundance when the plants are in health. They are very impatient of cold, and must be placed in the tan-bed of the bark-stove. Introduced 1716.

10. **ARUM MACULATUM** (common Arum). Eng. bot. t. 1298. *The leaves all radical, hastate-sagittate; lobes deflexed, spadix club-shaped, obtuse, shorter than spathe.*—This is a well-known perennial plant, a native of many parts of Britain, generally growing under hedges, remarkable for its acrimony, and the singular structure of its fructification. "At the first approach of spring," says Sir James E. Smith, "the verdant shining leaves of Arum are seen shooting up abundantly wherever any brushwood protects them from the tread of men or cattle. In May the very extraordinary flowers appear. In autumn, after both flowers and leaves have vanished, a spike of scarlet berries, on a simple stalk, are all that remains; and few persons are aware of the plant to which they owe their origin."

The root is tuberous, about the size of a chesnut, with numerous capillary fibres, brown externally, and white and fleshy within. The leaves, which spring immediately from the root, are large, entire, smooth, of a dark green colour, frequently spotted, and supported on long channelled footstalks. The flower stem is a simple scape, obscurely channelled, and terminated by the spathe, inclosing the parts of fructification. The spathe is erect, pale green, sometimes spotted, very concave and pointed. The spadix is of a deep purple colour; at its base are several roundish germen and a ring of sessile anthers; above these is placed many roundish bodies, terminated by longish filaments; these Linnæus calls the nectaries. The fruit

consists of several globular berries, of a bright scarlet colour when ripe, crowded on an oblong spike, each berry containing two or more seeds.

Qualities.—The root is nearly white, and free from smell. When recent, it is very acrimonious; so much so, that on tasting a small piece an insupportable sensation of burning and pricking is produced, which lasts several hours. Applied to the skin, it produces blisters; but its acrimony is lost by drying, which leaves the root a farinaceous substance, which in some countries has been converted into bread: and being saponaceous, is used in France, under the name of Cypress Powder, as a cosmetic. Water and spirit abstract the acrid principle, but derive no virtues from it; it is entirely on the acrid properties that its medical virtues depend. The expressed juice reddens vegetable blue, and has been found to contain malate of lime. Starch has also been prepared from it.

In the Isle of Portland, the common people gather the roots of spotted Arum, and send the produce to London, where it is sold as Portland sago.

The berries are devoured by birds; and Mr. Curtis thinks that even the roots are eaten by them, particularly by pheasants.

The root, newly dried and powdered, has been given as a stimulant, in doses of a scruple and upwards; but in being reduced to powder it loses much of its acrimony; and there is reason to suppose that the compound powder which takes its name from this plant, owes its virtues chiefly to the other ingredients.

Warzel, a German practitioner, has administered the fresh root of Arum to dogs; they died at the end of from twenty-four to thirty-six hours, without any other symptom than dejection, and the digestive canal was found somewhat inflamed.

Bulliard relates the following case: "Three woodman's children ate of the leaves of this plant; they were seized with horrible convulsions. Assistance was procured for them too late; it was impossible to make the two youngest swallow any thing; they were bled without success; clysters were given them, which produced no effect: they died, one at the expiration of twelve days, another at the end of sixteen. The other child was still able to swal-

low, although with considerable pain, because its tongue was so swelled that it filled the whole cavity of the mouth; but deglutition became free after being bled. The child was made to drink milk, warm water, and especially an abundance of olive oil. A diarrhoea came on, which saved the child; it was pretty well restored in a short space of time, but always preserved a great degree of leanness."—*Histoire des Plantes Veneneuses de la France*, p. 84.

The roots should be taken up for use in autumn, and may be preserved tolerably fresh in sand for several months. Mr. Miller says, they are generally gathered in the spring, when they shrink, and soon lose their pungent quality; but that those which are taken up in August, when the leaves decay, will continue good a whole year; and that the not observing this rule has brought them into disrepute.

This plant, having attracted much notice from the vulgar, has a variety of English names. Gerard gives us *Wake-robin*, *Cuckoo-pint*, or *pintle*, *Priest's-pintle*, *Aron*, *Calf's-foot*, *Rampe*, and *Starchwort*. *Lords and Ladies* is also a common appellation; and in Worcestershire it is called *Bloody men's fingers*.

Common Arum growing naturally in woods, &c., is seldom admitted into gardens. It ought to be transplanted soon after the seeds are ripe, for by the end of October they will be putting out new fibres.

11. ARUM ITALICUM (Italian Arum). Bot mag. t. 2432. *Stemless; leaves veiny with white, hastate, sagittate; lobes auricled, divaricating; spadix clavate, shorter than spathe.*—Arum *Italicum* has been frequently confounded with *A. maculatum*. The whole plant is, however, nearly double the size; the leaves are not only larger and veined with white, but the posterior lobes go off at nearly right angles from the foot-stalk, or are hastate, not sagittate; the spathe is very large, of a yellowish pale green colour, at first erect, afterwards rolled back at the point; *germens* nearly globular, aggregate, sessile, occupying about an inch of the base of the *spadix*; a short distance above there is a ring of sessile anthers, occupying about a quarter of an inch, and both above them and between them and the germens, about an equal space

is occupied by filiform cirri, or sterile stamens: the upper part of the spadix is club-shaped, as in the common Arum, but always of a pale yellow colour.

It was in this species that M. Lamarck observed an extraordinary degree of heat, amounting almost to burning, in the spadix, at a certain epoch. This high temperature continues only a few hours. This observation is said to have been confirmed by Des Fontaines.

A hardy perennial. Native of Italy, Spain, and the south of France. Flowering in May and June. Introd. 1683.

12. *ARUM TENUIFOLIUM* (grass-leaved Arum). Bot. reg. t. 512. *Stemless; leaves linear, lanceolate; spadix subulate, longer than lanceolate spathe.*—A native of Italy, and said to have been cultivated here in 1570. The leaves appear later than the flower, all upon the root, very like those of Viper's grass (*Scorzonera*), five or ten inches long; spathe terminal, slightly recurved; spadix red, bending forward out of the spathe.

The fruit, according to Clusius, is white, and only just raised out of the ground.

13. *ARUM SPIRALE* (spiral Arum). Bot. mag. t. 2220. *Stemless; leaves linear, lanceolate; spadix lanceolate; shorter than the oblong lanceolate, spirally-twisted spathe.*—This rare species is a native of Tranquebar, in the East Indies. Flowering in April and May. Introduced 1816.

14. *ARUM FLAGELLIFORME* (whipcord Arum). Bot. cab. t. 326. *Leaves ovate, entire, or three-lobed; spathe urceolate at base, reflexed and taper-pointed at end; spadix length of spathe.*—This curious plant is a native of Bengal, is herbaceous, and flowers in the rainy season, which is there from the middle of June to the end of October. With us it is in bloom in April. The root is about the size of a walnut, and is easily increased by offsets, which are freely produced. It must be kept in the stove, and may be potted in rich loam, allowing it plenty of water while in a growing state.

ARUNDO.

Class Triandria Digynia. Nat. Ord. Gramineæ.

The Characters are—*Glume naked, beardless, two-valved; the valves wrap-*

ping up the paleæ, which are two-bearded, and surrounded by bristles; seeds inclosed in the paleæ.

1. *ARUNDO DONAX* (cultivated Reed-grass). *Stem woody at base; glumes about three-five flowered; florets as long as the glume.*—*A. Donax* is common in the south of France and Italy, where it is cultivated as fence-wood, for supporting the vine, for fishing-rods, and a great variety of purposes. In Spain and Portugal, it forms an article of commerce, and supplies materials for the looms, fishing rods, &c. of this country.

It is also used to thatch ricks and cottages, for which purpose it is more durable than straw. In the province of Scania they mow it twice a year, and their cattle eat it. The texture is so hard, that it ought to be cut very young, if we expect cattle to touch it.

It is a native of Europe, on the banks of rivers and ditches; flowering in July and August.

β. There is a cultivated variety of this grass in our gardens, with beautifully striped leaves. The stripes are generally green and white; but sometimes they have a purplish cast. This is called *Ladies' Laces*, *Painted Grass*, or *Riband Grass*.

CULTURE.—The cultivated Reed, although a native of warm countries, yet will bear the cold of our winters in the open ground, provided it be planted in a soil not too wet, and, if the winter should prove very severe, a little mulch be laid over the roots. It dies to the surface in autumn, and rises again the succeeding spring: if it be kept supplied with water in dry weather, it will grow ten or twelve feet high the same summer. It is very proper to intermix with trees and shrubs, or with tall plants and flowers, where it will have a good effect, in adding to the variety. This is propagated by parting the roots early in the spring, before they begin to shoot, and they will, in a year or two, if the ground be good, make very large stools, from which eight or ten canes are produced. It never flowers in England.

The sort with variegated leaves is much more tender than the other, and must be sheltered from frost, in order to be preserved through the winter in England.

ASARUM.

Class 11. 1. Dodecandria Monogynia. Nat. Ord. *Asarineæ*.

The Characters are—*Calyx three-ur cleft, superior; corolla 0; capsule riaceous, crowned.*

1. *ASARUM EUROPEUM* (common Asarabacca). Eng. bot. t. 1083. *Leaves niform, obtuse, twin veiny.*—Asarabacca is a native of many parts of Europe, in woods and shady places; flowering in April and May. With us it has been observed only in Lancashire. The root consists of many branched bres, and has a strong pungent smell, somewhat resembling pepper and ginger. The stems are very short, and perfectly simple, bearing a pair of dark-green, shining leaves, on long footstalks. Flowers solitary, terminal, drooping, on short downy stalk, and consisting of downy, dull purple, pitcher-shaped calyx, cut into three lobes, and crowning a roundish germen, which becomes leathery capsule, containing six seeds as many cells. The stamina are irregularly beaked.

The root powdered, and taken to the amount of thirty or forty grains, excites vomiting: if it be coarsely powdered, it generally purges. The powder of the leaves is the basis of most cephalic nuffs, which occasion a considerable discharge of mucus from the nostrils, without much sneezing. An infusion of one or two drachms of the leaves in wine causes vomiting. Allioni gives a particular account of the qualities of Asarabacca, and seems to have a high opinion of it, especially in obstinate intermittents, and above all, in the quartan ague. Others reject it entirely, holding it to be too acid when fresh, and totally insipid when dry. The *pulvis Asari compositus* of the London Dispensary has equal quantities of the dried leaves of Asarum, Marjoram, and Marum, and of the dried flowers of Lavender.

2. *ASARUM CANADENSE* (Canadian Asarabacca). Sw. b. fl. g. t. 95. *Leaves niform, mucronate.*—A native of N. America, growing, according to Pursh, in shady rocky situations, from Canada to Carolina. "The root is highly aromatic, and known by the inhabitants of those countries by the name of Wild Ginger." With us it is quite hardy, producing its curious flowers in May, and thriving well in a light sandy soil, in a shady situation. Its branches are short, but have an inclination to spread; the leaves are large, and the footstalks densely clothed with long villous hairs.

The flowers are like those of the other sort, growing close to the root, but are more inclining to green on the outside.

Linnaeus doubts whether it is not a mere variety of the first, on account of the leaves growing in pairs, though other circumstances indicated the contrary.

3. *ASARUM VIRGINICUM* (Virginian Asarabacca). Swt. br. fl. g. t. 18. *Leaves cordate, obtuse, smooth, stalked.*—The leaves are spotted on the upper surface like those of the Autumnal Cyclamen.

The flowers, though not so splendid as some others, are pretty, and very curious, and continue for a long time.

It thrives best in a peat soil, in a shady situation, and may be grown on rock work. It is readily increased by dividing at the root.

Native of Virginia and Carolina; also of several provinces in China. Both this and second sort were found by Thunberg in Japan. Cultivated in 1759, by Mr. Miller.

CULTURE.—The plants of this genus delight in a moist shady situation, and may be increased by parting the roots in autumn. Too much wet will rot the Canadian sort in the winter. If the third species be too much exposed to the sun in summer, it seldom thrives well; it should therefore be planted in a border where it may have only the morning sun.

ASCLEPIAS (the name of many ancient physicians.)

Class Pentandria Digynia. Nat. Ord. *Asclepiadeæ*.

The Characters are—*Corona five-leaved, with a process on the inside; pollen masses fixed by a fine end; stigma depressed, blunt.*

1. *ASCLEPIAS SYRIACA* (Syrian Swallow-wort). Blackw. t. 521. *Leaves oval, downy beneath; stems simple; umbels nodding.*—It creeps greatly at the root, and sends up strong stems upwards of four feet high; towards the top of them the flowers come out on the side; these are of a worn-out purple colour, smelling sweet; and sometimes are succeeded here by large oval pods. It flowers in July.

The French in Canada eat the tender shoots in spring, as we do Asparagus. The flowers are so odoriferous as to make it very agreeable to travel in the

woods, especially in the evening. They make a sugar of them, gathering them in the morning, when they are covered with dew. Poor people collect the cotton from the pods, and fill their beds with it, especially for their children.

On account of the silkyness of this cotton, Parkinson calls the plant Virginian silk.

Kalm says that horses never eat it. The stems dye a good olive colour.

Native of North America. Parkinson, who has described it very particularly, says that it came to him from Virginia, where it groweth abundantly, being raised up from the seed he received: he must have cultivated it therefore before 1629.

2. *ASCLEPIAS SALICIFOLIA* (willow-leaved Swallow-wort). Bot. cab. 272. *Leaves stalked, elliptical-lanceolate*.—It produces its delicate white flowers in our stoves for at least four months during the summer and autumn; they have a very agreeable smell.

The seeds ripen with us; it may also be increased either by cuttings or dividing the roots; the soil should be rich loam.

3. *ASCLEPIAS CURASSAVICA* (curassavian Swallow-wort). Bot. reg. t. 81. *Leaves lanceolate, smooth, shining*.—The root is fibrous; the stem seldom rises above three feet in height, it is, as well as the foliage, of a full deep green. Upon attentive inspection, a whitish pile will be perceived to spread itself more or less over the whole plant, but more copiously on the stem, peduncles, and calyx. The umbels are upright, rather numerous, but not crowdedly flowered; bloom scarlet and saffron-coloured.

The seed, buoyed by a silky plume, is wafted far and near, like that of our thistle, and like that attaches itself to whatever it meets in its course, and separates at last from the plume which has suspended it to seek the soil and germinate, proving, by this habit, a troublesome weed. Even in our hot-houses, where it seeds freely, an inconvenience is perceived, in as far as the other plants are disfigured by the downy seed.

Mr. Miller affirms that these roots have been sent to England for Ipecacuanha, from which, however, they may be easily distinguished, the true Ipecacuanha having jointed, fleshy

roots, which run deep into the ground. The juice of the plant, made into a syrup with sugar, has been observed to kill and bring away worms wonderfully, even when most other vermifuges have failed; it is given to children in the West Indies, from a tea-spoonful to a table-spoonful. The juice and pounded plant is applied to stop the blood in fresh wounds, and is said to be a powerful astringent in such cases. The root dried and reduced to powder is frequently used by the negroes as a vomit; and hence its name of Wild or Bastard Ipecacuanha.

Plants of it last with us three or four years, but after the second year become naked, and do not produce so many flowers as at first. So that it is best to keep a succession of them, which may be easily done by seed. The mould in which they are planted should be rich, the pots kept constantly in the tan bed, and water supplied very sparingly in the winter. Introduced 1692.

4. *ASCLEPIAS NIVEA* (almond-leaved Swallow-wort). Bot. mag. t. 1181. *Leaves ovate, lanceolate, smooth; stem simple; umbels erect, lateral, solitary*.—The most remarkable feature of *A. nivea* is the very lax umbel, the flowers of which droop, from the want of strength in the pedicels. They have no smell.

Native of Virginia and the Carolinas: is considered as a hardy herbaceous perennial, but is liable to be destroyed in severe winters, unless protected from the frost. It flowers in July and August, and is propagated by parting its roots. Introduced 1732.

5. *ASCLEPIAS VIRGATA* (twiggy Swallow-wort). Swt. fl. g. t. 85. *Leaves opposite, lanceolate; tapering towards the base*.—It is a very desirable plant for the flower garden, on account of its elegant growth and abundant flowering, succeeding best in peat soil, and may be increased by dividing at the roots or by seeds, which sometimes ripen. A native of Mexico, but quite hardy, having endured the hard winter of 1829-30 in the open ground, in a warm, sheltered, south border.

6. *ASCLEPIAS INCARNATA* (flesh-coloured Swallow-wort). Bot. reg. t. 250. *Leaves lanceolate, smooth; stem divided upwards; umbels erect, in pairs*.—This puts out several upright stalks,

about two feet high; at the top are produced close umbels of purple flowers; these appear in August, but are not succeeded by seeds here. It first came from Canada, but has since been found growing naturally in several other parts of America, in swamps, and on the banks of rivers.

It was cultivated by Mr. Miller in 1731.

The flowers possess a fragrance that seems to have some resemblance to that of the Peruvian Heliotrope.

7. *ASCLEPIAS AMACENA* (oval-leaved Swallow-wort). *Stem simple, downy, in two rows; leaves subsessile, oblong, oval, downy beneath.*—This beautiful and rare species was originally introduced to this country in the year 1732. It attains the height of four or five feet, growing erect and stout.

8. *ASCLEPIAS PURPURASCENS* (purple Virginia Swallow-wort). *Stem simple; leaves ovate, villous beneath; umbels erect.*—The stems are many, as thick as the little finger, at bottom quadrangular, with blunted angles, and of a brownish green colour; above round, green, and a little hairy. Leaves on short petioles, from four to six inches long, and two or three broad; the midrib purple. The flowers differ from those of *A. amœna*, in having the petals of a dusky herbaceous colour, the horns of the nectaries paler, more gaping, not erect, but horizontal. It is a native of North America; was cultivated in 1732 by Dr. Sherard, and flowers from July to September.

9. *ASCLEPIAS TUBEROSA* (tuberous-rooted Swallow-wort). Bot. reg. 76. *Stem erect, hairy, with spreading branches at end; leaves scattered, lanceolate, hairy.*—A plant very generally native in most of the states of America, where it goes by several denominations; such as "Butterfly-weed," from being a favorite resort of the insects of that tribe—"Pleurisy, or Ache-in-the-side plant," from its medicinal virtues, besides some others.

Mr. Pursh mentions, "that he had found it growing on mounds of sand, which had been gradually accumulated by the wind to a considerable height, having a root which descended to near two fathoms in depth."

The flowers are both singular and interesting; and where a suitable soil can be found for the growth of the

plant, it should form a portion of every collection.

It is considered to be highly medicinal.

The best mode of administering the *Asclepias* root is in decoction or substance. A teacup full of the strong decoction, or from twenty to thirty grains of the powder, may be given in pulmonary complaints several times in a day.—It should be raised from seeds, which, as they are not frequently produced in England, must be obtained from America. If transplanting be required, perform it when the plants are one year old, as when its tuberous root has become large it does not bear transplanting well.

It loves a dry, sandy, or gravelly soil.—With us it is usual to plant it in pots, and protect it, during winter, in a frame.

10. *ASCLEPIAS QUADRIFOLIA* (four-leaved Swallow-wort). Bot. cab. t. 1258. *Leaves stalked, elliptic.*—A native of North America, lately introduced. It is found from New York to Virginia, generally growing on limestone rocks. It flowers from May to July at about a foot in height. With us it is a hardy perennial plant, of easy culture, increased by dividing the roots: it may be kept in a pot or planted in a border: the soil should be light sandy loam.

11. *ASCLEPIAS VERTICILLATA* (whorl-leaved Swallow-wort). Swt. f. g. t. 144. *Stem erect, simple, downy in lines; leaves very narrow, linear, mostly whorled; umbel many flowered.*—This delightfully fragrant plant seldom exceeds two feet in height, and is often considerably less. It is a native of North America, and has been introduced to our collections ever since the year 1759, but is still very rare in them, owing, we believe, to its best mode of cultivation not being sufficiently well known. It thrives luxuriantly in a warm border of very sandy loam, and requires to be planted a good depth in the soil, as the frosts, if severe, will be liable to injure the young buds, that are to produce the flowering stems for the following season. It may occasionally be increased by dividing the root, as it produces its flowers so late in the season, that it will seldom ripen its seeds with us except the autumn be very mild. The flowers are of a greenish white, tinged with purple at the back; they are

small, and are produced in June and July.

12. *ASCLEPIAS VARIEGATA* (variegated Swallow-wort). Bot. Mag. t. 1182. *Leaves ovate, rugose, naked; stem simple; umbells subsessile; flower-stalks downy.*—It is one of the most desirable of the genus, and is esteemed to be hardy, but being a native of the Southern states of North America, is liable to be destroyed in severe winters, and probably for this reason is still very rare, though cultivated by Mr. Miller.

It resembles *A. purpurascens*, but the leaves are rough, and the umbels of flowers more compact; they come out on the side of the stalk, are of an herbaceous colour, and are not succeeded by pods in this country.

It appears from Plukenet to have been cultivated in 1696, and flowers in July. Propagated by parting its roots.

13. *ASCLEPIAS DECUMBENS* (decumbent Swallow-wort). Sw. f. g. t. 24. *Leaves villous; stem decumbent.*—A handsome plant, but is a much scarcer species than *A. tuberosa*, to which it is nearly related; it is also more beautiful, the flowers being larger, and the umbels produced in more abundance. The umbels grow at the extremity of the branches, and the flowers are of a bright orange colour. It thrives best in peat, and in favourable seasons it will produce seeds, which is the best way of increasing it, as it weakens the plant considerably by dividing the roots. Flowers from June to September.

CULTURE.—The *Asclepiades* or Swallow-worts are either shrubs or tall upright perennial herbaceous plants, milky and poisonous, or at least acrid.

In this numerous genus, only two species are European; two or three are from South America; the rest are natives of North America, the East and West Indies, or Africa. Such as are inhabitants of North America are, as well as the Europeans, hardy enough to bear the open air, and therefore are proper for large borders in pleasure grounds and to mix with shrubs. The other species require the protection of the green-house or stove; and all of them are tall perennials, flowering from June to August and September, mostly dying down to the root in autumn. They should have little water, especially in winter; for as they abound with a milky juice, much wet will rot

them. They may be propagated by seeds, where these can be obtained; or by cuttings; the hardy sorts may be increased by parting the roots.

ASCYRUM.

Class Polyadelphia Polyandria, Nat. Ord. *Hypericineæ*.

The Characters are—*Calyx four-leaved; petals four; capsule one-celled, two-three-valved.*

1. *ASCYRUM CRUX ANDRÆ* (St. Andrew's cross *Ascyrum*). *Stem round; branches erect; leaves ovate, linear, blunt, generally fasciated in the axille; inner sepals orbicular.*—This is a low plant, the stalks seldom rising more than six inches high; they are slender, and divide into two towards the top. From between the divisions of the branches, loose panicles of yellow flowers are produced; being very small, they make little appearance.

It is a native of North America. Mr. Miller cultivated it in 1759, having received it from Hugh Duke of Northumberland, who procured it from America. It flowers in July and August, and may be increased by laying down its branches: it loves a moist soil and shady situation.

2. *ASCYRUM HYPERICOIDES* (*Hypericum-like Ascyrum*). *Stem round; leaves oblong, linear, blunt, with two glands at base; inner sepals somewhat orbicular.*—This is an elegant little shrub, seldom rising above three feet in height. It is very full of leaves and branches. Flowers terminating, peduncled, solitary.

It is a native of South Carolina, Virginia, Maryland, and the cooler mountains of Jamaica. Mr. Miller cultivated it in 1579.

It rarely produces seeds in England, but may be propagated by cuttings made of the young shoots in May, which, if planted in pots, and plunged into a very moderate hot-bed, will take root in five or six weeks, when they may be transplanted into a warm border, where they will endure the cold of our ordinary winters; but in severe frosts they are frequently destroyed, unless the roots are covered with tan to keep out the frost.

3. *ASCYRUM AMPLEXICAULE* (stem-clasping *Ascyrum*). *Stem dichotomous panicled; leaves ovate, cordate, crisp; corymbs naked; styles three.*—The flowers and leaves are longer in this than

in any other of the species. They make a very pretty appearance during the months of July and August. Native of North America, in low grounds and woods, from Virginia to Florida. Introduced 1806.

4. *ASCYRUM PUMILUM* (dwarf Ascyrum). *Stem small, simple, quadrangular; leaves oval, blunt, fascicled; petioles six lines long, reflexed.*—A native of North America, particularly in the pine barrens of Georgia. It seldom attains to more than four inches in height, flowering from June to August. Introduced 1806.

5. *ASCYRUM STANS* (large flowered Ascyrum). *Stem winged, straight; leaves ovate, elliptical, blunt, glaucous; inner sepals cordate orbicular.*—An elegant-looking shrub, native of Carolina, flowering from July to September. Introduced 1806.

CULTURE.—The species of this genus require to be protected during winter by a frame; for this purpose they should be grown in pots, as they never exist long in the open border. A mixture of one half peat, and the other sand will suit them well, and young cuttings will root in sand under a bell-glass.

ASIMINA (a name coined by Adanson, without any meaning).

Class Polyandria Polygynia. Nat. Ord. *Anonaceæ*.

The Characters are—*Calyx three-lobed; petals six, spreading, ovate-blond; the inner smallest; anthers sessile; berries, usually three, sessile; seeds several.*

1. *ASIMINA TRILOBA* (trifid-fruited Asimina). *Cat. car. 2. t. 83. Leaves blong, cuneate, acuminate; branches quite smooth.* A small tree, or rather large shrub. Native of Pennsylvania, Florida, Virginia, and Carolina, on the overflowed banks of rivers. The berries are large, yellow, ovate, oblong, and eatable. The flowers appear in May and June. All parts of the tree have a rank, if not a fetid smell; hence the fruit is relished by few. It may be increased by layers put down in the autumn, or by seeds procured from their native country. Introduced 1756.

2. *ASIMINA PARVIFLORA* (small-flowered Asimina). *Leaves cuneate, obovate, mucronate beneath, as on the branches, rufous with down.*—This species is a native of Virginia, Georgia, and Carolina, in shady woods, near rivers

and lakes. Flowering in April and May. It is a small shrub, bearing fruit when two feet high. The berries are fleshy, the size of a plum. Introduced 1806.

3. *ASIMINA PYGMEA* (dwarf Asimina). *Bart. trav. t. 8. Leaves oblong, linear, long-cuneate; branches quite smooth.*—A little shrub, hardly a foot high, with twiggy branches, long narrow leaves, and white flowers. Found in sandy fields, in Georgia, Florida, and Carolina; flowering from April to June. Introduced 1812.

CULTURE.—The species of this genus will do well in England in the open air, in a warm situation, in a mixture of sand and peat. They may be increased by layers, or by seeds.

ASPALATHUS (the name of a thorny shrub in Dioscorides. Plato feigns tyrants to be tormented with thorns of Aspalathus in the infernal regions).

Class Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx 5-fid, upper segment largest; legume ovate, blunt, about two-seeded.*

1. *ASPALATHUS CHENOPODA* (goose-foot Aspalathus). *Bot. mag. t. 2225. Leaves fascicled, three-angular, mucronate, stiff, hairy; heads hairy.*—A greenhouse shrub, with the stem much branched; branchlets short, hairy, terminated with a capitulum of flowers, inclosed in an involucre of hairy, linear, mucronate leaves, much less rigid than those on the stem; leaves subulate, thinly hairy, fasciculate, the outer ones in the bundles much longer than the inner, all armed with a very sharp pungent mucro. Flowers large, yellow, stained with red; vexillum much larger than the Ala and Carina, villous on the outside. They are produced in July.

It is a plant of rare occurrence in our collections, though supposed to have been cultivated by Miller in 1730.

2. *ASPALATHUS CRASSIFOLIA* (bristle-pointed Aspalathus). *Bot. rep. 333. Leaves fascicled, fleshy, round, smooth, setaceous at end; flowers capitate, terminal.*—A tender greenhouse plant, growing to the height of eighteen inches, very bushy, and covering itself with yellow flowers about July. A native of the Cape of Good Hope. Introduced 1800.

3. *ASPALATHUS CARNOSA* (fleshy-3 B

leaved *Aspalathus*). Bot. mag. t. 1289. *Leaves fascicled, fleshy, round, smooth; flowers lateral, terminal, smooth.*—It is a pretty little shrub, native of the Cape, and must be kept in a greenhouse during the winter months. Flowering in May and June. Introduced 1795.

4. *ASPALATHUS ARANEOSA* (cobweb *Aspalathus*). Bot. mag. t. 829. *The leaves fascicled, filiform, lax, hairy; heads hairy.*—The stem is shrubby, with pendulous woolly branches. The flowers are bluish-white, and terminal, collected in a capitulum nearly sessile, intermixed with bracts, like the leaves, three to each flower, the length of the calyx; when dried they appear yellow. This elegant shrub is a native of the Cape of Good Hope; growing from two to four feet in height, and flowering in June and July. Introduced 1794.

5. *ASPALATHUS ARGENTEA* (silver-leaved *Aspalathus*). *The leaves ternate and fascicled, ovate, silky; heads downy; stem dichotomous.*—It rises to the height of four feet, with a shrubby stalk, dividing into slender branches. The flowers are purple, downy, and grow thinly on the branches; they come out late in the summer. Cultivated by Mr. Miller in 1759.

6. *ASPALATHUS CALLOSA* (oval-spiked *Aspalathus*). Bot. mag. t. 2329. *The leaves three, three-cornered, smooth; spikes ovate.*—It is rarely to be met with in our collections. The specific name of this shrub is derived from the round callous stipules that grow at the base of the leaves, and remain after these fall off, giving the branches a warty appearance. The leaves grow by threes, but are so much crowded together that they seem to be without order. The erect position of the alæ and carina, with the curved extremities of the former, give the flower a very singular appearance.

It is a native of the Cape of Good Hope, and requires the protection of the greenhouse. Flowering in August.

7. *ASPALATHUS MUCRONATA* (mucronate-leaved, or thorny-branched *Aspalathus*). *The leaves ternate; leaflets blunt; branches spiny.*—A shrub, from three to four feet in height. The stem is smooth, with remote branches, not warted; they draw gradually to a point, and are, as it were, spiny. Racemes of flowers terminating, yellow. They

make their appearance in June and July. Introduced 1796.

8. *ASPALATHUS PEDUNCULATA* (pedunculated *Aspalathus*). Bot. mag. t. 344. *The leaves fascicled, subulate, smooth; peduncles filiform, twice as long as leaf.*—It will grow to the height of several feet, produces abundance of blossoms, which open during most of the summer months; they are of a yellow colour, tinged with purple. Propagated by cuttings. A native of the Cape. Introduced 1775.

CULTURE.—This genus comprises nearly ninety species; they are, with very few exceptions, natives of the Cape of Good Hope; and are rather ornamental when in flower. They will all grow freely in a mixture of sandy loam and peat, and young cuttings will strike in sand, under bell-glasses, but the glasses must be wiped occasionally, or the cuttings are very liable to damp-off. Some of the species ripen seeds freely, by which they are readily produced.

ASPARAGUS.

Class Hexandria Monogynia. Nat. Ord. *Asphodeles*.

The Characters are—*Flower six-parted, erect; the three lower sepals reflexed at end; berry three-celled, many seeded.*

1. *ASPARAGUS OFFICINALIS* (common *Asparagus*). Eng. Bot. t. 339. *Stem herbaceous, round, erect; leaves setaceous.*—*A. officinalis*, is one of the oldest and most delicate of culinary vegetables. It is found on the seashore in different parts of Britain, and in many parts of Europe, and is abundant in the inland sandy plains in Russia, Turkey, and Greece. *Asparagus* was in much esteem both among the Greeks and Romans. It is much praised by Cato and Columella; and Pliny mentions a sort which grew near Ravenna, a deep sandy country, three shoots of which would weigh a pound. It is equally admired by the moderns, and assiduously cultivated in private gardens every where, and to a great extent round London, Paris, and Vienna; but in no part of the world is it grown to such perfection as in the market gardens round London. That of the parish of Mortlake is particularly strong and succulent: the soil is a sandy loam, deeply trenched, and well manured;

the seed is sown in drills and thinned out till the plants stands six inches apart in the row, and the rows are a foot asunder. Round Paris and Vienna, more pains are taken in preparing the soil, by forming excavations and filling them with layers of turf, durable manure, as bones, wood-chips, &c., sand, manure, loam, &c.; but though plantations on such beds last longer than on ours, they do not yield better shoots and may justly be questioned whether they be equally profitable to the cultivator.

The culinary preparations of Asparagus are few, its very delicate flavour being rather deteriorated than improved by powerful tastes. It is best boiled and served alone, to be eaten with butter and salt; or with the points of the shoots cut up in small pieces, and served up as green pease.

In Queen Elizabeth's time Asparagus was eaten, says Gerarde, "sodden in fish-broth, or boiled in faire water, and seasoned with oile, vinegar, salt, and pepper, then served at men's tables for sallade."

At the present time it is principally served to table on a toast, or ragout. It makes an excellent soup. The esculent part is the early shoots or buds, when three or four inches high, and partially emerged from the ground in May and June.

Medicinally, Asparagus is esteemed diuretic, and in Paris is much resorted to by the sedentary operative classes, when they are troubled with symptoms of gravel or stone. Dr. James recommends it to be eaten at the beginning of dinner, when he tells us, it is grateful to the stomach. If eaten before dinner it refreshes and opens the liver, spleen, and kidneys, and puts the body in an agreeable state. It was said by the ancients, that, if a person annointed himself with a liniment made of Asparagus and oil, the bees would not approach him.

There are two varieties cultivated, viz.: 1. The *Red-topped*, rising with a large head, full, close, and of a reddish-green. 2. The *Green-topped*, rising with a smaller head, not generally so lump and close, but reckoned better favoured.

The *Battersea*, *Deptford*, *large Travessend*, *large Reading*, the *Dutch*,

Cork, and *Early Mortlake*, are sub-varieties.

Estimate of Sorts.—Both varieties are in great estimation: the red-topped is most generally cultivated by market-gardeners; and the green-topped in private gardens. Both succeed by the same mode of culture.

Mr. Miller was of opinion, that the common Asparagus which is cultivated for the use of the table, might probably have been brought by culture to its present perfection, from the wild sort which grows naturally in Lincolnshire, where the shoots are no larger than straws. It is well known how much the Asparagus is improved in size since Gerard's time (1597); and it might be still further improved if our gardeners were to import roots of this plant from the borders of the Euphrates, where it grows to an extraordinary thickness.

Mr. Miller observes that "The *Garden Asparagus* is propagated by seeds, in the procuring of which, there should be particular care to get it from a person of skill, who may be depended upon for his choice of the shoots, and integrity in supplying you with his best seeds. But where a person is in possession of some good beds of Asparagus, it is much the best way to save it himself; in order to which, a sufficient number of the fairest buds should be marked early in the spring, and permitted to run up for seeds; because those which run up after the season for cutting the Asparagus is over, are generally so backward as not to ripen the seeds unless the summer is warm and the autumn very favourable. In the choice of the buds to be left for seeds, there must be great regard had to their size and roundness, never leaving any that are inclinable to be flat, or that soon grow open-headed, always choosing the roundest and such as have the closest tops. But as several of these produce only male flowers which are barren, a greater number of buds should be left than might be necessary if there could be a certainty of their being all fruitful. When the buds are left, it will be proper to thrust a stick down by each, but there must be care had in doing this, not to injure the crown of the root. These sticks will serve as marks to distinguish them from

the others when they are all run up. Toward the end of September the berries will be fully ripe, when the stalks should be cut off, and the berries stripped into a tub, in which they may remain three weeks or a month to sweat, by which means the outer husks will be rotten; then fill the tub with water, and with your hands break all the husks by squeezing them between your hands. These husks will all swim upon the water, but the seeds will sink to the bottom; so that by pouring off the water gently, the husks will be carried along with it, and by putting fresh water two or three times, and stirring your seed about, you will make it entirely clean: then spread the seed upon a mat or cloth, and expose it to the sun and air in dry weather, until it is perfectly dry, when it may be put into a bag, and be hung up in a dry place till the beginning of February, which is the proper season for sowing it; at which time you must prepare a bed of good rich earth made very level, whereon you must sow your seeds (but not too thick, which will cause the plants to be small); then tread the bed all over to bury the seed in the ground, and rake it over smooth.

"The following summer keep the ground diligently cleared from weeds, which will greatly add to the strength of the plants; and toward the latter end of October, when the haulm is quite withered, you may spread a little rotten dung over the surface of the ground, about two inches thick, which will preserve the young buds from being hurt by the frosts, &c.

"*Planting.*—The spring following the plants will be fit to plant out for good (for plants of more than one year's growth are unfit to remove, as I have often experienced; for young plants are much better than old, and will produce finer roots): you must therefore prepare your ground by trenching it well, burying therein a good quantity of rotten dung at the bottom of each trench, that it may lie at least six inches below the surface of the ground; then level the whole plot very exactly taking out all large stones: but this should not be done long before you intend to plant your Asparagus, in which you must be governed according to the nature of your soil or the season; for if your soil is dry and the season

forward, you may plant early in March: but in a wet soil, it is better to wait till the end of that month, or the beginning of April, which is about the season that the plants are beginning to shoot. I know many people have advised the planting of Asparagus at Michaelmas, but this I have experienced to be very wrong; for in two different years I was obliged to transplant large quantities at that season, which I had been have thrown away; for upon examination in the spring, I found most of the roots were grown mouldy, and decaying, and I am sure, not one in five of them succeeded, and those which did were so weak, as not to be worth their standing.

"The season being come for planting, you must, with a narrow pronged dung-fork, carefully fork up the roots, shaking them out of the earth, and separating them from each other, observing to lay their heads even for the more convenient planting them, which must be performed in this manner:

"The plot of ground being levelled, you must begin at one side thereof, ranging a line very tight across the piece, throwing out a trench exactly straight, by the line about six inches deep, being careful not to turn up the dung; into which trench you may lay your roots, spreading them with your fingers, and placing them upright against the back of the trench, that the buds may stand forward, and be about two inches below the surface of the ground, and at twelve inches distance from each other; then with a rake, draw the earth into the trench again, laying it very level, which will preserve the roots in their right position; then remove the line a foot further back, and make another trench in the like manner, laying therein your plants as before directed, and continuing the same distance row from row, only observing between every four rows to leave a distance of two feet four inches for an alley to go between the beds to cut Asparagus, &c.

"The plot of ground being finished and levelled, you may sow thereon a small crop of Onions, which will not hurt the Asparagus, provided the Onions are not too close, and tread in the seeds, raking the ground level.

"There are some persons who plant the seeds of Asparagus in the place

here the roots are to remain, which is a very good method, if it is performed with care. The way is this: after the ground has been well trenched and leveled, they lay it level, and draw a line across the ground (in the same manner as is practised for planting the young plants); then with a dibble make holes at a foot distance, into each of which they drop two seeds, for fear they should miscarry; these holes should not be more than half an inch deep; then cover the seeds, by striking the earth in upon it, and go on removing the line a foot back for another row; and after four rows are finished, leave a space for an alley between the beds, if it is designed to stand for the natural season of cutting; but if it is to be taken up for hot-beds, there may be six rows planted in each bed, and the distance between the rows need not be more than nine inches. This should be performed by the middle of February, because the seeds lie long in the ground; but if Onions are intended to be sown upon the ground, that may be performed a fortnight or three weeks after, provided the ground is not stirred so deep as to disturb the Asparagus-seeds, in raking the Onion-seeds into the ground.

"As the roots of Asparagus always send forth many long fibres, which run deep into the ground, so when the seeds are sown where they are to remain, the roots will not be broken or injured, as those must be which are transplanted, therefore will shoot deeper into the ground, and make much greater progress, and the fibres will push out on every side, which will cause the crown of the root to be in the centre; whereas, in transplanting, the roots are made flat against the side of the trench.

"When the Asparagus is come up, and the Onions have raised their seed-leaves upright (which will be in six weeks after planting) you must with a small hoe cut up all the weeds, and thin the crop of Onions where they may have come up in bunches: but this must be done carefully, and in dry weather, that the weeds may die as fast as they are cut up, being careful not to injure the young shoots of Asparagus, as also to cut up the Onions which grow near the shoots. This work must be repeated about three times, which if well done, and the season not too wet, will keep the ground free from weeds

until the Onions are fit to be pulled up, which is commonly in August, and is known when their greens fall down and begin to wither. When you have drawn off the Onions, it will be necessary to clean the ground well from weeds, which will keep it clean till the alleys are dug to earth the beds, which must be done in October, when the haulm is decayed; for if you cut off the haulm while green, the roots will shoot fresh again, which will greatly weaken them. The young haulm should be cut off with a knife, leaving the stems two inches above ground, which will be a guide to distinguish the beds from the alleys; then with a hoe clear off the weeds into the alleys, and dig up the alleys, burying the weeds in the bottom, and throw the earth upon the beds, so that the beds may be about three or four inches above the level of the alleys: then a row of Coleworts may be planted in the middle of the alleys, but never sow or plant any thing upon the beds, which would greatly weaken the roots; nor would I ever advise the planting of Beans in the alleys, as is the practice of many, for that greatly damages the two outside rows of Asparagus. In this manner it must remain till spring, when, some time in March, the beds should be hoed over, to destroy all young weeds; then rake them smooth, and observe all the succeeding summer to keep them clear from weeds, and in October dig up the alleys again, as was before directed, earthing the beds, &c.

"*Dressing.*—The second spring after planting, some persons begin to cut some of the buds of Asparagus for use, though it would be much better to stay until the third year: therefore now the beds should be forked with a flat pronged fork made on purpose, which is commonly called an Asparagus-fork: this must be done before the buds begin to shoot in the spring, and should be performed with care, lest you fork too deep, and bruise the head of the root; then rake the beds over smooth, just before the buds appear above ground, which will destroy all young weeds, and keep your beds clean much longer than if left unranked, or if done so soon as forked. When the buds appear about four inches above ground, you may then cut them; but it should be done sparingly, only taking the large buds, and suffering the small to

run up to strengthen the roots; for the more you cut, the greater will be the increase of buds, but they will be smaller and the roots sooner decay. In cutting the buds, you must open the ground with your knife (which should be very narrow pointed, and long in the blade and filed with teeth like a saw), to see whether any more young buds are coming up close by it, which might be either broken or bruised in cutting the other, then with the knife saw it off about two inches under ground. This may appear a very troublesome affair to people unacquainted with the practical part, but those who are employed in cutting Asparagus will perform a great deal of this work in a short time: but care in doing it is absolutely necessary to be observed by all who cut Asparagus.

"The manner of dressing the Asparagus-beds is every year the same as directed for the second, viz. keeping them clean from weeds in summer, digging the alleys in October, and forking the beds towards the end of March, &c.; only observe every other year to lay some rotten dung (from a Melon or Cucumber-bed) all over the beds, burying some in the alleys also, at the time for digging them up. This will preserve the ground in heart to maintain the roots in vigour, and by this management, a plot of good Asparagus may be continued for ten or twelve years in cutting, and will produce good buds, especially if it is not cut too long each season; for when it is not left to run up early in June, the roots will be greatly weakened, and the buds will be smaller: therefore, in those families where Asparagus is required late in the season, a few beds should be set apart for that purpose, which will be much better than to injure the whole plantation, by cutting it too long.

"*Dunging.*—I cannot help taking notice of a common error that has long prevailed with many people, which is, that of not dunging the ground for Asparagus, believing that the dung communicates a strong rank taste to the Asparagus, which is a great mistake, for the sweetest Asparagus is that which grows upon the richest ground; for poor land occasions that rank taste so often complained of, the sweetness of Asparagus being occasioned by the quickness of its growth, which is always proportionable to the goodness of

the ground, and the warmth of the seasons. In order to prove this, I planted two beds of Asparagus upon ground which had dung laid a foot thick; and these beds were every year dunged extremely thick, and the Asparagus produced from these beds were much sweeter than any I could procure, though they were boiled together in the same water.

"*Quantity.*—The quantity of ground necessary to be planted with Asparagus, to supply a small family, should be at least eight rods: less than that will not do; for if you cannot cut one hundred at a time, it will scarcely be worth while, for you must be obliged to keep it after it is cut two or three days, especially in cold seasons, to furnish enough for one mess; but for a larger family, sixteen rods of ground should be planted, which, if a good crop, will furnish two or three hundred each day in the height of the season.

"*Forcing.*—But as there are people who delight in having early Asparagus, which has become a very great trade in the kitchen-gardens near London, I shall give proper directions for the obtaining it at any time in winter.

"You must first be provided with a quantity of good roots, (either of your own raising, or purchased from such gardeners as plant for sale,) such as have been two or three years planted out from the seed-bed; and having fixed upon the time you would willingly have your Asparagus fit to cut, about six weeks before, you should prepare a quantity of new stable horse-dung, which should be thrown in a heap for ten days or more, to ferment, mixing some sea-coal ashes with it; then it should be turned over into a heap, where it must lie another week, when it will be fit for use. Then dig out a trench in the ground where you intend to make the bed, the width of the frames that are designed to cover it, and the length in proportion to the quantity you intend to have—which if designed only to supply a small family, three or four lights at a time will be sufficient—but for a larger family, six or eight lights will not be too much; then lay down your dung into the trench, working it very regularly, and beat it down very tight with a fork, laying it at least three feet in thickness or more, when the beds are made in December; then put your

th thereon about six inches thick, making the clods and laying it level; and at one end, begin laying your roots against a little ridge of earth, raised out four inches high: your roots must be laid as close as possible one to the other, in rows, with their buds standing upright, and between every row a small quantity of fine mould, serving to keep the crown of the roots exactly level. When you have finished laying the bed with roots, you must lay some stiff earth up to the roots, on the outsides of the beds which are bare, to keep them from drying, and thrust two or three sharp-pointed sticks about two feet long, down between the root, in the middle of the bed, at a distance from each other. The use of these sticks is to inform you what temperature of heat the bed is in, which you may find by drawing up the sticks, and feeling the lower part; and if, after the bed has been made a week, you find it doth not heat, you may lay a little straw or litter round the sides, and also upon the top, which will greatly help it; or, if you find it very hot, so as to be in danger of scorching of the roots, it will be advisable to let it remain wholly uncovered, and to thrust a large stick into the dung on each side of the bed, in two or three places, to make holes for the great steam of the bed to pass off, which in a short time will reduce the bed to a moderate heat.

"After the bed has been made a fortnight, you must cover the crowns of the roots with fine earth, about two inches thick; and when the buds begin to appear above ground through that earth, you must again lay on a fresh quantity, about three inches thick; so that in the whole it may be five inches above the crowns of the root, which will be sufficient.

"Then you must make a band of straw, or long litter, about four inches thick, which must be fastened round the sides of the bed, that the upper part may be level with the surface of the ground; this must be fastened with straight sticks about two feet long, sharpened at the points, to run into the bed; and upon this band you must set your frames, and put your glasses thereon; but if, after your bed hath been made three weeks, you find the heat decline, you must lay a good lining of fresh horse-dung round the sides of

the bed, which will add a fresh heat thereto; and in bad weather, as also every night, keep the glasses covered with mats and straw: but in the day time let it be all taken off, especially whenever the sun appears; which, shining through the glasses, will give a good colour to the Asparagus.

"A bed thus made, if it works kindly, will produce buds for cutting in about five or six weeks, and will hold about three weeks in cutting; which, if rightly planted with good roots, will produce in that time about three hundred buds in each light; so that where Asparagus is proposed to be continued until the season of the natural being produced, a fresh bed should be made every three weeks, until the beginning of March, from the time of the first bed being made; for if the last bed is made about a week in March, it will last till the season of natural Asparagus; for the last beds will come a fortnight sooner to cut after making, than those made about Christmas; and the buds will be larger, and better coloured, as they will then enjoy a greater share of the sun.

"Where this method of forcing early Asparagus is intended, there should be every year such a quantity planted which you shall judge necessary, (unless you intend to buy the roots from some other garden); the quantity of roots necessary to plant one light is commonly known by the measure of the ground where they grow; for where there is a good crop, and few roots are missing, one rod of ground will furnish enough for a light; but this calculation is made from the ground planted with roots which are designed to be taken up after two or three years growth, for forcing, in which there are six rows in a bed, at but ten inches distance, and the plants eight or nine inches asunder in the rows; but where there is a greater space between the rows, and fewer rows in a bed, then there must be a greater quantity of ground allotted for each light. Most of the kitchen-gardeners about London take up their Asparagus roots after two years of growth from planting; but where the land is not very good, it will be better to let it have three years growth, for if the roots are weak, the buds of Asparagus will be very small, so not worth the trouble of forcing. The best ground for planting Asparagus to have large roots for

hot-beds, is a moist rich soil; but for those that are to remain for a natural produce, a middling soil neither too wet nor too dry; but a fresh sandy loam, when well dunged, is preferable to any other."

On the Cultivation of Asparagus during the Winter.—M. Lindegaard, gardener to his Majesty the King of Denmark, in a communication to the Horticultural Society, says, "My chief crop is always delivered on the King's birth-day, January 28th, and forcing is consequently commenced four or five weeks before that date." He stirs up the beds in the open garden with a fork, and heightens them with a spit taken from the alleys, which are two feet wide; the beds are four feet wide, and there are two rows on each bed. He deepens the alleys to three and a half feet, then fills them with hot dung, and covers the beds with litter. One plank over the alley, and another along the centre of the bed between the two rows, enables a man to walk and gather the crop without injuring any thing.

On Growing Asparagus in single rows.—Mr. A. Dickson reckons that two rows, planted three feet and a half apart, and the plants nine inches from each other, will produce more than the rows planted in beds in the usual way.

In *France* they plant in beds five feet wide, separated by paths constructed of turf, two feet in breadth and one in thickness. The plants are placed eighteen inches asunder, spreading out the roots as wide as possible in the form of an umbrella, and keeping the crowns one and a half inch under ground. A pin is put to each plant as a mark, and, as soon as the earth is settled and dry, a spadefull of fine sand is thrown over each pin, in the form of a mole-hill.

Abercrombie states, when the buds come to be fully productive, five square poles of ground, planted with 1,600 plants, will yield from six to eight score heads daily.

Duration of the Plantation.—Abercrombie remarks, that "A plantation of Asparagus, under good culture, will mostly continue for ten or twelve years to afford plentiful crops; after which the stools usually decline in fertility, and the shoots in quality, so that, to provide a permanent annual supply, some fresh buds should be planted a sufficient time beforehand, allowing four

years for their advancing to a productive state."

Dr. Macculloch says the French beds, which he describes, "Will generally last *thirty years*; but if they be planted in such abundance as to require cutting once in two years, half the bed being always in a state of reservation, it will last for a *century or more*."

ASPERUGO (so called from its asperity).

Class Pentandria Monogynia. Nat. Ord. *Boraginæ*.

The Characters are—*Calyx five-parted, irregular; corolla funnel-shaped, with a short tube; orifice closed by convex scales; stigma obtuse; seeds oblong, compressed, not perforated.*

ASPERUGO PROCUMBENS (procumbent German Madwort). Eng. bot. t. 661. *Stem climbing, very rough; flowers small axillary.*—An annual plant of very rare occurrence. It is found in roads and among rubbish, at Newmarket, Boxley, in Sussex, &c., flowering in June and July. The root is small and slender; herb rough, and sticking to the hands or clothes, by means of small hooked spines. Such of these hooks as stand upon the stem point downwards, those on the leaves forwards. The flowers are of a deep blue. Horses, goats, sheep, and swine eat it, but kids are not partial to it. It may easily be propagated by seeds sown in autumn; or, if they be permitted to scatter, the plants will come up of themselves.

ASPERULA (from *Asper*, rough).

Class Tetrandria Monogynia. Nat. Ord. *Rubiaceæ*.

The Characters are—*Calyx an obsolete edge, four-toothed; corolla monopetalous, funnel-form; seeds two; glabrous not crowned by the calyx.*

1. ASPERULA ODORATA (sweet-scented Woodruff). Eng. bot. t. 755. *Th leaves eight, lanceolate; corymbs terminal, stalked; seeds echinate.*—Almost every dry mountainous wood abounds with Woodruff, nor is it unfrequent in the more level counties on a calcareous soil. It flowers in May.

The roots are perennial, creeping among dead leaves and the more light and friable vegetable mould, and throwing up numerous upright, annual stems. The flowers are white, and occasionally fragrant, particularly at night.

The fresh herb has no smell, but as soon as it begins to dry it exhales a

asant and lasting fragrance, like that new hay, verging towards the flavour bitter almonds, to the great surprise those who gather it and keep it about em unawares.

It is a very proper plant for planting woods and shrubberies, under trees, it prefers shady situations where scarcely any thing else will thrive.

2. *ASPERULA CYNANCHICA* (squinnawort, or small Woodruff). Eng. bot.

33. *Lower leaves four, lanceolate; upper linear very unequal, in pairs; stem erect; fruit smooth, tubercled.*—Grows on dry, chalky, sunny banks, in most parts of England. Flowering in the middle of summer. The root is perennial, but does not thrive well in a garden, requiring, probably, like many other plants, its natural shelter of herbage. The stems are mostly procumbent, erect at their extremities only. The flowers have a great degree of beauty, being white or bluish coloured, elegantly marked with red lines. They have a sweet smell, which, however, is rarely to be perceived.

Dalechampsius seems to be the chief authority for the reputation this plant has acquired in the cure of quinsies, from which its name is taken. He says it should be applied externally and taken internally. It is out of use, as we are now furnished with remedies of more undoubted efficacy, in the putrid as well as inflammatory sore-throat.

3. *ASPERULA ARCADIIENSIS* (Arcadian Woodruff). Bot. mag. t. 2146. *Hispid; leaves six, oblong, ovate, acute, revolute at edges; stems decumbent, branched.*—This lively little alpine plant, with rose-coloured flowers in terminal clusters was discovered by Mr. Hawkins on Mount Tyria, in Arcadia, and was first raised in this country at Spring Grove, from seeds and specimens sent by him to Sir Joseph Banks. It flowers in May. Introduced 1819.

4. *ASPERULA TINCTORIA* (narrow-leaved Woodruff). *The leaves linear, the lower six three-nerved, the middle four; the upper opposite; stem flaccid; corolla smooth, three-lobed.*—The whole plant is green and smooth. The stems are three feet in length. The roots are used in Gothland instead of Madder, for dyeing wool of a red colour. A native of Europe. Introduced 1764.

5. *ASPERULA ARVENSIS* (field Woodruff). *The lower leaves four, obovate,*

upper five-six-eight; flowers terminal, sessile, aggregated; involucre ciliated.

—The roots are annual and slender, with a yellow bark; they dye a fine red. The stem is upright, a foot high; a close umbel of sessile blue flowers terminate the stem and branches, surrounded with leaves of a lively green above, beneath whitish with hairs. It flowers in July, and is a native of Europe. Introduced 1772. It may be sown in the open ground and requires the same treatment as other hardy annual culture. *Asperula* is a genus of hardy herbaceous plants of which more than thirty species are known. They grow freely in common soil, and are readily increased by suckers from the roots.

ASPHODELUS.

Class Hexandria Monogynia. Nat. Ord. *Asphodelææ*.

The Characters are—*Flowers six-parted, spreading; six valves covering the ovary.*

1. *ASPHODELUS FISTULOSUS* (onion-leaved Asphodel). Bot. mag. t. 984. *Stem naked; leaves upright, straited, subulate, fistular.*—This is a native of Provence, Greece, Barbary, Spain, and Portugal. It was known to Gerard, and cultivated by him: but being too tender for our climate, is apt to be lost from time to time.

It is necessary to protect it in a frame during the winter. It flowers in May, and may be increased by separation, and occasionally by seeds, which sometimes ripen here. The soil should be light loam.

2. *ASPHODELUS TAURICUS* (Tanrian Asphodel). Redout. t. 470. *Stem leafy; leaves subulate, three-cornered, straited; bractes membranaceous, lanceolate, the upper longer than flowers.*—This is a native of Tauria and Caucasus, growing on rocks. It is perennial, and quite hardy with us.

It may be increased by separating the roots, and will thrive in any good garden soil, either potted or in a border. It flowers freely in the beginning of summer.

3. *ASPHODELUS TENUIOR* (slender-leaved Asphodel, or King's-spear). Bot. mag. t. 2626. *Raceme loose, bractes shorter than the peduncle.*—This species differs from *A. luteus* in being altogether smaller, with finer leaves, smooth and paler flowers; but is more espe-

cially distinguished by the stalk being naked at the upper part for a considerable distance below the raceme of flowers, and the bractes being as short as, or shorter than the peduncle.

A hardy perennial. Native of Northern Caucasus, where it flowers in the spring. Introduced 1824.

4. *ASPHODELUS CRETICUS* (Candian Asphodel). Bot. cab. t. 915. *Stem leafy; leaves ciliated toothed filiform, striated; bractes membranous, lanceolate; the upper longer than flowers.*—It is a hardy perennial plant, flowering in the month of June. The spikes of blossoms will rise to two feet in height, if planted in the ground, but not more than half the size in a pot. It may be increased by dividing the root, and will thrive in any good garden soil. A native of the Island of Crete. Introduced 1821.

5. *ASPHODELUS LUTEA* (yellow Asphodel, or King's-spear). Bot. mag. 773. *Stem leafy; leaves three-cornered, striated.*—Of all the species of Asphodel cultivated in our gardens, the *lutea* is by far the most common; which is easily accounted for, as it is perfectly hardy, will grow in any soil, and multiplies greatly by offsets, by which it spreads so much as to require frequent reducing.

Its flowering stems, covering the three-cornered striated leaves fancifully curling round it, rise to the height of two or three feet, and are terminated with a spike of yellow flowers, a foot or more in height.

The Asphodel-root was to the ancient Greeks and Romans, what the potatoe now is to us, a bread plant, the value of which cannot be too highly estimated. It has long since given way to its successors in favour; and if now permitted to blossom, it is only in obscure corners of gardens, in which it perhaps was formerly the principal plant.

So universally has the Virginian plant superseded that of Troas, that we no longer consider the Asphodel as an article of food, and were it not for the occasional appearance of the King's-spear, in our parterres, this plant which nourished the ancients, and the verses in which it is celebrated by the poets, would have been equally forgotten.

The origin of this vegetable is traced

in fabulous history to that memorable apple which Discord threw into the assembly of the gods, who attended the nuptials of Peleus and Thetis, as a prize for the fairest of the goddesses.

The decision of Paris in favour of Venus is said to have offended Juno and Minerva so highly that they endeavoured to break the beautiful crook which Pan had given to the shepherd of Ida, but which was saved by its turning into the blossom of a yellow Asphodel, so much resembling a royal sceptre.

Pliny calls it one of the most sovereign and renowned herbs that the world produces; and says the roots boiled with husked barley are certainly the most restorative that can be taken by consumptive persons, or those whose lungs are affected. He adds that no bread is so wholesome as that which is made of these roots and the flour of grain mixed together. The same author tells us that the roots of the Asphodel were generally roasted under the embers, and then eaten with salt and oil; but when washed with figs they were thought a most excellent dish; and that these plants were so productive that it was not uncommon to see eighty bulbs or roots clustered together.

The seed of this vegetable was also eaten when parched or fried, and it was generally planted by the Roman husbandmen before the gates of their farms, under the superstitious idea that it would preserve the place from charms and sorceries.

The Asphodel is said to be useful in driving away rats and mice, which have so great an antipathy to this plant, that if their holes be stopped up with it, they will die rather than pass it; and it is stated, that if a house be smoked with this root, it also banishes mice, or proves a poison to them.

This plant will thrive in any soil, if planted about three inches deep; it is principally raised by dividing the roots, as the cultivation by seed is more tedious. It blossoms best in a damp soil, or when it is well watered.

CULTURE.—Asphodelus is a genus of stately plants, that thrive well in common garden soil, they are very ornamental when in flower; and increase freely by offsets from the roots.

ASPIDIUM a genus of Ferns, containing more than 190 species, inhabiting all parts of the globe. The male fern

Meliss-mas) is common to Europe in shady places and woods. The root consists of many matted fibres, forming a fleshy or caespitose head, of the thickness of the finger, blackish and scaly.

It has been celebrated from time immemorial as a specific for worms. It appears to have been used as such by Theophrastus, Dioscorides, Galen, &c.; but seems to have been neglected by moderns, until the publication of **Mame Naser's** specific for the tape worm, by the French government again brought into notice.

According to her plan of administering it, from one to three drachms of the powdered root were directed to be taken in a large cupful of water in the morning, while the patient was in bed, and two hours afterwards, a strong cathartic of calomel and gamboge, proportioned to the age and strength of the patient, was given; and if necessary, the further operation was promoted by a dose of purging salts; nothing but broth being taken till the worms came away; if this, however, did not happen on the same day, the process was ordered to be repeated.

A. Barometz is the famous Scythian lamb of which so many fables have been related. Although it is often brought in a fresh state to the markets of Macao, as an article of medicine, no plants have ever been brought to this country alive. Its name has arisen from the resemblance which its brown hairy footstalk bears to a little rufous dog crouching; and the belief in its animal nature has been confirmed by the fact of the juice, which is of a rich blood colour, soon becoming thick by exposure to the air. It was also fabled that no plant could grow near it.

CULTURE.—The *hardy* species will thrive well in common garden soil, in a shady situation, and are readily increased by seeds or by dividing the roots. The *greenhouse* kinds grow freely in a mixture of sandy loam and peat, and are increased in the same manner as the *hardy* species.

ASPLENIUM (spleen-wort) is another genus of Ferns, containing more than 150 species, some of which are very handsome. It was formerly held to be a sovereign remedy for all diseases of the spleen, and to be so powerful as even to destroy it if employed in excess.

CULTURE.—They grow chiefly in old

walls, or on stony banks, but will thrive well in pots or rock-works; and are increased by seeds, or dividing the roots. The *greenhouse* and *stove* species grow freely in a mixture of loam and peat, and are increased in the same way as the *hardy* ones.

ASSONIA (in honour of Jg. de Asso, a distinguished Spanish botanist).

Class Monadelphia Polyandria. Nat. Ord. *Byttneriaceæ*.

The Characters are—*Calyx girded by a three-crenate, one-leaved involucre; antheriferous filaments 15, three fertile between each sterile one; styles 5, very short; carpels 5, two-seeded, closely connected into a single capsule; seeds rather trigonotrous, not winged.*

1. **ASSONIA POPULNEA** (Poplar leaved Assonia). *Leaves cordate, acuminate, smooth, a little serrated; peduncles scarcely longer than the petioles.*—This is a middle sized tree, the wood is sweet-scented, and blue in the centre; when it is of a certain age it becomes very hard. The flowers are produced in a sort of corymb, both axillary and terminating; they are of a beautiful red colour, and appear in May. It is a native of the hilly woods in the island of Bourbon. It will grow freely in any light rich soil. Young cuttings planted in mould under a hand-glass, in heat will soon strike root.

2. **ASSONIA CORDIFOLIA** (heart-leaved Assonia). Bot. mag. t. 2905 (under *Dombeya angulata*). *Leaves smooth, cordate, acuminate, serrated, five-seven nerved.*—It is a fine handsome growing shrub, ten to twelve feet high, much branched, clothed with greyish wrinkled bark, naked below. The flowers are large and of a red colour. A native of the Mauritius. Introduced 1820. It will thrive well in sandy loam; and young cuttings will root freely in sand, under a hand-glass, in a moist heat.

ASTELMA.

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle naked; pappus feathery, sessile; rays connate at base; involucre imbricated, with scarious scales, the interior of which are connivent.*

1. **ASTELMA EXIMIUM** (giant Astelma). Bot. reg. t. 532. *Leaves sessile, ovate, close, erect, downy; corymb sessile.*—This most magnificent and splendid shrub is found in a wild state five

hundred miles from the Cape, on the borders of the Caffre country, from whence the natives bring bundles of the dried plant to the Cape as presents; in this state the plant has long since been imported from that fertile coast. It is about two feet in height, the stalks are shrubby and but little branched; may be raised from seeds, and also from cuttings. Flowers in July. Introduced 1793. Belongs to the greenhouse, and should be kept as dry as possible. When it is necessary to give it water it should never come in contact with the foliage or flowers.

2. *ASTELMA SPECIOSISSIMUM* (showy Astelma). Bot. rep. t. 51. *Stem upright, shrubby; leaves embracing the stem, lance-shaped, and three-nerved.*—This handsome species of Astelma was introduced, according to the Kew catalogue, by Mr. F. Masson, from the Cape, in 1787; it is, nevertheless, a very scarce plant, being subject to decay from our winter damps, therefore requiring a dry stove for its protection. The blossoms (or rather the flower-cups, for they are the persistent parts) are easily preserved for many years, in all their brilliancy, by cutting them, when they first expand: but our atmosphere seems uncongenial to the ripening of their seeds, and is with great difficulty increased by cuttings. The soil it most approves is sandy peat, with a small portion of loam.

3. *ASTELMA STÆHELINA* (keel-leaved Astelma). Bot. rep. t. 428. *The leaves oblong, lanced, attenuated at base, and silky.*—It is a shrubby, erect, greenhouse plant, a native of the Cape, with terminal, naked, one-flowered peduncles; flowers yellow; and it is propagated by cuttings. Introduced 1801.

4. *ASTELMA SPIRALIS* (spiral-leaved Astelma). Bot. rep. t. 262. *The leaves spirally-tiled, keeled, rather oblique; flowers solitary, very large.*—This species of Astelma is very common in Cape Town. The flower lasts nearly three months; it is the largest of the genus, and certainly one of the most beautiful. It is very liable to rot from damps in the winter, therefore should be kept on an airy dry shelf, as near the glass as possible during the foggy months. It in general ripens seeds with us, but is with difficulty increased by cuttings; which should be made early in spring, planted in pots of sand, and kept quite dry for some time after they

are planted. The grown plants thrive best in a very sandy peat earth.

5. *ASTELMA CANESAENS* (elegant Astelma). Bot. mag. t. 420. *The leaves imbricated, ovate, subulate, smooth.* It is a weak, branched, and widely-spreading plant if left to itself, and does not appear to advantage in a collection unless carefully tied to a stick. It succeeds best in a warm situation, on a shelf in front of the stove, for it requires more heat than the greenhouse affords; thus situated, it begins flowering in the autumn, and continues in blossom all the winter and spring; when the flowers are out of bloom they droop, but will continue a long while in the plant in that state, and even continue to expand and look beautiful when the sun shines on them. It is a native of the Cape, and is propagated by cuttings.

6. *ASTELMA MODESTUM* (modest Astelma). Bot. mag. t. 2710. *The leaves alternate, almost filiform, waved, semicylindrical on the back, grooved in front.*—The stems are decumbent at the base, throwing up numerous erect branches, which are stiff and rigid, covered with a dense cottony down. The leaves are about two inches long, thickly clothed with white down. The peduncles terminate the branches, and are from two to three inches long, cottony, and single flowered. Florets all tubular, perfect, yellow, five-toothed. A native of the Cape. Flowering in June. Introduced 1825.

ASTER.

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Involution imbricated, its lowermost scales spreading (except in A. trifolium); receptacle naked; florets of the ray more than ten; pappus simple.*

1. *ASTER REFLEXUS* (reflexed leaved Starwort). Bot. mag. t. 884. *Leaves ovate, sub-imbricated, recurved, serrate-ciliated; heads terminal.*—The singular merit of this pretty hardy greenhouse plant, whose flowers resemble those of the common daisy, is, that its blossoms are still to be seen through the whole year, and is kept with as little care as is required for any. Its unusual foliage also affords some appearance of novelty. The upper side of the ray of the flower is perfectly white; the tips of the under side are stained a blood red. It is

ative of the Cape, and is easily propagated by cuttings, or by seeds, which it sometimes produces with us. Introduced 1794.

2. *ASTER DENTATUS* (tooth-leaved starwort). *Stem shrubby; leaves toothed, iron-colour beneath; heads terminal, one-three flowered.*—This plant cannot undoubtedly be considered as amongst the most beautiful of the vegetable productions of New Holland; but nevertheless, from the continuance of its flowering, is very desirable as a greenhouse plant, as it begins to expand its blossoms about December, and from that time till about August is rarely seen without flowers.

It is a low-growing shrub, seldom exceeding a foot in height, and very branching. Like most plants from Botany Bay, it delights in a light sandy soil, is easily propagated by cuttings, and seeds. Introduced 1793.

3. *ASTER ARGOPHYLLUS* (musk-scented Starwort). Bot. mag. t. 1563. *Leaves ovate, lanceolate-toothed, silky beneath; panicles compound, axillary; rays five.*—This species grows to a small tree, the wood of which, as we are informed by Mr. Brown, is remarkably hard. It is much admired for the delicate scent of musk, which the leaves retain for a long time after they are dried, as well as when recent. Native of Van Dieman's Land, flowering in May. Introduced in 1804. Should be kept in the greenhouse, and propagated by cuttings.

4. *ASTER LIRATUS* (fluted stemmed Starwort). Bot. mag. t. 1500. *Stem fluted; leaves stalked, alternate, lanceolate, blistered, repand-toothed, downy beneath.*—It grows erect, with few branches, and bears its white flowers in panicles, sometimes terminal and sometimes lateral. The leaves are intensely and durably bitter, when chewed, though the first taste is slightly acid and acrid. Flowers in June and July. May be propagated by cuttings. Requires to be kept in the greenhouse during the winter. Native of New South Wales. Introduced 1802.

5. *ASTER VILLOsus* (villous Starwort). *Leaves linear, filiform, obtuse, hairy; involucre imbricated.*—This species was introduced in 1790 from New Holland: it also grows in Van Dieman's Land. It is a slender shrub, which will sometimes attain the height of three feet, particularly if planted out in

a conservatory. The flowers appear in May; they are very lively, and "the plant very well merits cultivation." It requires the greenhouse protection, and may be increased with difficulty by cuttings, but much better by seeds, which are occasionally sent from its native country. It should be potted in sandy loam and peat.

6. *ASTER FRUTICOSUS* (small shrubby Cape Aster). Bot. mag. t. 2718. *Leaves spreading, linear, approaching to spatulate, impressed with dots, the margin quite entire and recurved.*—A very desirable greenhouse plant, from the Cape of Good Hope, flowering in May. The stem is woody, and much branched in a zig-zag manner; from eight inches to a foot and a half high. The flowers are solitary, *florets* of the ray purple; of the centre yellow. It appears to have been cultivated by Miller in 1759.

7. *ASTER TENELLUS* (slender Starwort). Bot. mag. t. 33. *Leaves filiform, acuminate, ciliate; involucre hemispherical.*—We are indebted to North America for most of our Asters, but the present species, which is omitted by Miller, and is rather a scarce plant in this country, though not of modern introduction, being figured by Plunkenet and described by Ray, is a native of Africa, and, like a few others, requires in the winter the shelter of a greenhouse. It is particularly distinguished by having very narrow leaves with short bristles on them, and by its blossoms drooping before they open. Disk of the corolla yellow; ray blue; often, and especially in the night, rolled back. It is a perennial, flowers in September and October, and may be propagated by slips and cuttings.

8. *ASTER ALPINUS* (alpine Starwort). Bot. mag. t. 199. *Stem one-flowered; radical leaves lanceolate, spatulate; cauline, lanceolate, scales of involucre nearly equal, lanceolate, bluntish.*—A native of the Alps, introduced about 1800. It is an ornamental perennial hardy plant, growing to about one foot in height. Its blossoms are large and showy, making their appearance much earlier than any of the others, and continuing in blossom three weeks or a month. It may be increased by separating the root, and thrives either in a pot, or planted in the full ground, in light loamy soil. If carefully watered in dry weather, will grow among rock-work, for which, from its size, it is well adapted.

9. **ASTER SALSUGINOSUS** (salt plain Michaelmas Daisy). Bot. mag. t. 2942. *Leaves mostly lanceolate, acute, those of the stem sessile, gradually smaller upwards, attenuated at base; germen oblong, surmounted by the simple scabrous hairs of the pappus.*—This handsome species of ASTER was first detected by Dr. Richardson on the salt plains of the Athabasca, North America. From a woody and fibrous perennial root spring one or more purplish stems, about a foot high. The flowers solitary, or two or three at the extremity of the stem, in luxuriant plants are large and showy. They make their appearance in May and June. This might therefore rather be called *summer* than the *Michaelmas* daisy. Introduced 1827.

10. **ASTER ALWARTENSIS** (fine rayed Starwort). Bot. mag. t. 2321. *Leaves ovate, narrowed at base, entire, about five-nerved; involucre lax, squarrose.*—This very showy dwarf Aster is a native of Caucasus, flowering in May. It approaches nearest to *A. alpinus*, but differs in too many points to be taken for that species. Introduced 1800.

11. **ASTER ACRIS** (acid Starwort). *Leaves linear, lanceolate, glabrous, not dotted, three-nerved; involucre imbricated, twice as short as disk.*—The stems divide into a great number of branches, which divide again towards the top into several small ones, with very narrow leaves their whole length. The flowers grow in large clusters at the top, forming a sort of corymb; they are of a pale bluish colour, and appear in the beginning of August. It grows naturally in the South of Europe. Introduced 1731.

12. **ASTER CORDIFOLIUS** (heart-leaved Starwort). *Leaves cordate, pilose beneath, finely serrated, stalked; stem panicled, smoothish; panicle spreading.*—It grows about two feet high, having slender stalks; the upper part of the stalks is divided into several small branches, which are terminated by white flowers growing in loose panicles. They appear in September. Introduced 1759.

13. **ASTER UNDULATUS** (waved leaved Starwort). *Leaves oblong, cordate, amplexicaul, entire; petioles winged; stem panicled, hispid; branchlets onesided.*—It grows naturally in North America; the stalks rise between two and three feet high, which send out small side branches, upon which the flowers come out in loose spikes, they

are of a very pale blue colour, inclining to white. Introduced 1699.

14. **ASTER PRÆCOX** (early flowering Starwort). *The leaves oblong, lanceolate, serrated, narrow at base; stem hairy; involucre imbricated, nearly equal; outer scales somewhat spreading.*—It sends up several strong hairy stalks, which rise a foot and a half high, and divide into many small branches at the top, forming a kind of corymbus, each being terminated by one large blue flower, flowering the latter end of July. It grows naturally on the Alps, is very hardy, but should have a moist soil and a shady situation. It is propagated by parting the roots.

15. **ASTER TENUIFOLIUS** (slender-leaved Starwort). *Leaves linear, lanceolate, narrow both ways, hispid at edges; stem smooth; involucre imbricated.*—It sends up stalks five feet high, which puts out many slender side branches, and terminated by spikes of small white flowers, which appear at the end of October. It spreads greatly at the root, and is apt to over-run the borders.

16. **ASTER ERICOIDES** (heath-leaved Starwort). *Leaves linear, glabrous, those of the branches subulate, close together; of the stem long; involucre subsquarrose; leaflets acute.*—It shoots up slender stalks three feet high, which send out slender side branches most of their length, so as to form a thick bush; these are covered with very narrow leaves their whole length, and are terminated by single flowers.

17. **ASTER CONCOLOR** (self-coloured Starwort). *Leaves oblong, lanceolate, hoary on each side; stem simple, erect, downy; raceme terminal.*—It rises four feet high, with a single stalk, which terminates by slender loose spikes of pale blue flowers, which appear about Michaelmas. This grows naturally in North America, and was introduced 1759.

18. **ASTER AMELLUS** (Italian Starwort). Bot. reg. t. 340. *The leaves oblong, lanceolate, scabrous; involucre imbricate; subsquarrose; leaves broad; inner membraneous, coloured at edge.*—The Italian Starwort, was some years past more common in the gardens than at present; for since the great variety of American Starworts have been introduced into England, this sort has not been so much cultivated, though it is by no means inferior to the best of them,

and in some respects, preferable to most; for it is not so subject to creep by the root as many of the American sorts, hereby they often become troublesome in small gardens; nor do the stalks require supporting as they do, for these seldom grow more than two feet high, and are so strong, as to be in little danger of being broken by the wind. These grow in large clusters from the root, and each of them branch at the top into eight or ten foot-stalks, each terminated by a single large flower, having blue rays, with a yellow disk. It flowers in August, and in mild seasons, will often continue till the middle of November, during which time they are very ornamental plants in a garden. Is propagated by parting the roots, soon after the plant is out of flower; for those which are removed in the spring will not flower so strong the succeeding autumn. The roots should not be removed oftener than every third year, where they are expected to produce many flowers.

It grows naturally in the vallies of Italy, Sicily, and Narbonne, and is generally supposed to be the *Amellus* mentioned by Virgil in his fourth Georgick to grow in the pastures; the leaves and stalks being rough and bitter, the cattle seldom browse upon them, so that they remain after the grass is eaten bare, and, making a fine appearance when they are full of flowers, might well engage the poets' attention. Cultivated in 1596 by Gerard.

19. *ASTER NOVÆ ANGLIÆ* (New England Starwort). Bog. reg. t. 183. *Leaves linear, lanceolate, pilose, amplexicaul, auricles at base; stem simple, pilose, straight; heads sessile, clustered, terminal.*—It sends up many shoots from the root; they are generally five feet in height, and are terminated by large purple violet flowers, growing in a loose panicle. It flowers in August, and continues to enliven our gardens with its gay flowers at the close of the year. Being very hardy, will grow in any soil or situation. Is propagated by parting the roots. Introduced 1710.

20. *ASTER GRANDIFLORUS* (great-flowered Starwort). Bot. reg. t. 273. *Leaves, linear, rigid, acute, subamplexicaul, those of the branches reflexed, hispid at edge; scales of involucre squarrose.*—It is a hardy perennial, and flowers in our gardens in November; but from the lateness of the season, the

flowers seldom appear in perfection, unless the stems have been cut off and placed in the house in water, where they will expand completely, and last for a long time in beauty.

21. *ASTER PATENS* (spreading hairy Starwort). Swt. fl. g. t. 224. *The leaves lanceolate, ciliate, cordate, amplexicaul, scabrous on each side, hairy; stems branched, hairy.*—A very handsome species, well worth cultivation in all collections; the stem is eighteen inches to two feet in height, more or less branched, and terminated in a spreading panicle of flowers of a light blue colour, inclining to purple. It will flower from August to November, in the open borders of the flower garden, thriving well in the common garden soil, and is readily increased by dividing at the roots. A native of N. America. Introduced 1773.

22. *ASTER TRIFOLIUM* (sea-side Starwort). Eng. bot. t. 87. *Stem glabrous; leaves linear, lanceolate, fleshy, obscurely three-nerved; scales of involucre, lanceolate, membranous, obtuse, imbricated.*—The root is perennial, with long fibres, stems from six inches to three feet high, leafy, branched, and producing abundance of flowers, which are not unornamental. Sometimes these flowers are perfectly destitute of rays. The rays, when present, are generally of a delicate pale purple; sometimes they are white. It is a native of salt marshes on the sea coast of Europe, and by inland salt in Germany and Siberia.

It is frequent about Bristol, and not only on the coast, but in the interior parts of the kingdom, where Dr. Stokes with good reason, supposes that its presence indicates the existence of salt springs. It flowers in July and August. Morison observes, that in the morning, the flowers being expanded, appear blue: the blue florets quickly vanishing, and the disk remaining, they then appear yellow; in the evening these go off, and the white down of the seeds shews itself; it thus undergoes a triple change in the course of the day, and hence derives its name *Trifolium*.

23. *ASTER PUNICEUS* (red-stalked Starwort). *Leaves amplexicaul, lanceolate, serrated, roughish; branches panicled; involucre lax, longer than disk.*—Sends up several strong stalks, upward of two feet high, which are of a purple colour; the flowers grow upon single foot-stalks, forming a corymb at the

top, and of a pale red colour. These appear towards the latter end of September. Introduced 1710.

24. *ASTER NOVA BELGII* (New York Starwort). *Leaves sub-amplexicaul, lanceolate, glabrous, scabrous at edge, lower sub-serrated; branches divided.*—It rises nearly four feet high, having broad leaves at the bottom, which diminish gradually to the top; the flowers, which are of a pale blue colour, are produced in a loose kind of umbel at the top of the stalks. They appear at the latter end of August. Native of North America. Introduced 1710.

25. *ASTER SEROTINUS* (late-flowering Starwort). *The leaves oblong, acuminate, lanceolate, smooth, scabrous at edge; lower serrated; branches corymbose, smooth.*—The stems are numerous, three feet and a half high, shooting out many lateral branches, terminated by pretty large flowers, very pale blue, tending to white. A native of Virginia. Flowering from September to November.

26. *ASTER TRADESCANTI* (Tradescant Starwort, commonly called Michaelmas Daisy). *Leaves lanceolate, sessile, smooth; branches virgate; involucre imbricated; stem round, smooth.*—This was brought from Virginia many years ago, by Mr. John Tradescant, who was a great collector of rarities; and from his garden it was soon dispersed, and became common. It is generally known by the title of Michaelmas Daisy, from its flowering about old Michaelmas day. The stalks of this sort are numerous, and rise about three feet and a half high. These shoot out many lateral branches, which are terminated by pretty large flowers, of a very pale bluish colour, tending to white. The roots multiply very fast, and the seeds are often blown about, so that it propagates so much as to be troublesome; it will thrive in any situation.

27. *ASTER MISER* (meagre-flowered Starwort). *Leaves sessile, lanceolate, serrated, smooth; involucre imbricated; leaflets acute; stem rather villous.*—It rises with slender stalks, upwards of three feet high, sending out many weak branches on every side; the flowers come out on short pedicels on every side of the branches; they are small, with white rays and a yellow disk; they appear in November, and often continue part of December. Native of North America. Introduced 1759.

28. *ASTER ACUMINATUS* (pointed leaved Michaelmas Daisy). Bot. mag. t. 2707. *Leaves lanceolate, broadest above the middle, so as to be somewhat cuneate, and thence to the point incised-serrate, at the base and at the extremity acuminate.*—This is one of the few well marked species of this ill-understood genus, which, flowering in the latest season of autumn, constitute the chief ornament of our garden, till winter comes.

“To rule the varied year.”

It is characterized by its erect, simple, flexuous stalk; large and uniform leaves, together with the long, slender bracteated pedicels to the flowers. A native of the Alleghany mountains, flowering in October. Introduced 1806.

CULTURE.—In this numerous genus, containing more than 180 species, the far greater number are hardy, herbaceous, fibrous-rooted, autumn-flowering, showy perennials, with annual stems, from one to five feet in stature; they thrive well in any soil or situation, and increase abundantly by suckers from their roots. America has furnished a considerable number of them; and they are particularly adapted to adorn large borders and plantations of shrubs in the later season. Some species from the Cape and New Holland are shrubby plants of the greenhouse, and must be sown in the spring, and when potted off, be kept with the other greenhouse plants: a mixture of sandy loam and peat suits them best, and cuttings root readily in the same kind of soil, under a hand-glass, without bottom heat.

ASTEROCEPHALUS.

Class Tetandria Monogynia. Nat. Ord. *Dipsacæ*.

The Characters are—*Involucrum simple, silky, many-leaved, unequal; pappus five-seven bearded; receptacle paleaceous.*

1. *ASTEROCEPHALUS GRAMINIFOLIS* (Grass-leaved Asterocephalus). Bot. reg. t. 835. *Corolla radiant; leaves linear, lanceolate entire; stem herbaceous, one-flowered.*—An old inhabitant of the flower garden, introduced it is said, in 1683. It is a hardy perennial plant, native of the most mountainous parts of Europe, and continues in flower nearly the whole summer. From the root arise three or four stalks, the lower parts of which have silvery-coloured leaves about four inches long. The upper part of the stalk is

naked for six or seven inches in length, and sustains at the top one pale blue flower. It may be increased by slips, planted over a shady border in the beginning of April. When these have put out good roots, take them up with balls of earth, and transplant them where they are to remain. It loves a soft loamy soil, and a shady situation.

2. *ASTEROCEPHALUS ATROPURPUREUS* (sweet *Asterocephalus*). Bot. mag. t. 247. *Corolla radiant; leaves cut; receptacle of the flower subulate.*—This species has long and deservedly held a place as an ornamental plant in our gardens, the flowers are well adapted for nosegays, have a sweet musky smell, and are produced in great profusion from June to October. There is a great variety in their colour, some being of a purple approaching to black, others of a pale purple, some red, and others variegated. Native of the East Indies. Introduced 1629.

It is a hardy biennial, requiring yearly to be raised from seeds; these should be sown about the end of May, in a shady border of fresh earth, thinning the plants as they advance to the distance of three or four inches: in autumn they should be removed into the border, where they are intended to flower, thus treated they will become good strong plants against winter, flowers early the ensuing summer, and produce abundance of perfect seed.

3. *ASTEROCEPHALUS ELEGANS* (elegant *Asterocephalus*). Bot. mag. t. 286. *Corolla radiant; radical leaves lanceolate, stalked, entire; cauline pinnated; stem one-flowered.*—This species have very great affinity to *A. graminifolius*, but the stem is more erect, the flowers are much larger, the leaves broader, and less silvery, with longer and more rigid hairs; but the most material difference appears to be in the length of the internal calyx, which in *graminifolius* is hardly longer than the external. It is a hardy perennial, flowering in July and August. The flowers continue long in beauty. Native of Mount Caucasus. Propagated by seeds. Introduced 1803.

4. *ASTEROCEPHALUS COLUMBARIA* (fine leaved *Asterocephalus*). Eng. bot. t. 134. *Corolla radiant; radical leaves ovate, or lyrate, pubescent, crenate; cauline pinnate, setaceous.*—Peculiar to chalk, limestone, or gravelly countries;

but there not uncommon, flowering from June to August. The root is perennial, woody and tufted. The stem is twelve or eighteen inches high, erect, round, leafy, a little branched on the upper part. The flowers are terminal, of a bluish lilac colour. The marginal florets are large and radiant, and all the florets are five-cleft, by which it is easily distinguished. In this country it grows about the walls of Norwich, also in Yorkshire, Devonshire, &c.

5. *ASTEROCEPHALUS WEBBIANA* (Webb's *Asterocephalus*). Bot. reg. t. 717. *Silky; lower leaves stalked, roundish, or cuneate, rugose, crenate; upper pinnatifid; florets uniform, longer than involucre.*—A native of Ida, flowering in October. Introduced 1830.

6. *ASTEROCEPHALUS ARGENTEA* (silvery *Asterocephalus*). Flora Græc. t. 108. *Corolla radiant; leaves pinnatifid; segments linear; peduncles very long; stem rounded.*—A low perennial plant, with a branching stalk spreading wide on every side; the flowers are small, pale, and have no scent; they appear from June to October. The leaves are of a silvery colour. A native of the Levant. Introduced 1713.

7. *ASTEROCEPHALUS PROLIFERA* (prolific *Asterocephalus*). Flor. græc. t. 107. *Corolla radiant; flowers subsessile, stems dichotomous; leaves oblong, lanceolate, nearly entire, pubescent.*—The repeatedly forked leafy stem, with a nearly sessile buff-coloured flower between each of the divisions, gives this species a peculiar appearance. It is a hardy annual. Native of Egypt, and of the isle of Cyprus, in cultivated fields; flowering in July and August. Introduced 1758.

8. *ASTEROCEPHALUS CRETICUS* (cretan *Asterocephalus*). *Corolla radiant; leaves lanceolate, nearly entire; stem shrubby.*—It rises with a shrubby stalk three feet, and divides into several woody knotty branches. The leaves are silvery, four inches long, and a quarter of an inch broad. The flowers stand upon very long naked peduncles at the end of the branches, and are of a fine blue colour. Native of Candia and Sicily; flowering in September. Introduced 1596.

9. *ASTEROCEPHALUS LIMONIFOLIUS* (Limonium leaved *Asterocephalus*). *Leaves cuneate, quite entire, wrinkled and hoary underneath.*—In this species

the root is divided above; the stems are frutescent at the base, erect, simple; flowering scape among the leaves almost leafless: a foot high. It is a native of Sicily, flowering in August. Introduced 1596.

10. *ASTEROCEPHALUS AFRICANUS* (African *Asterocephalus*). *Corolla equal; stem shrubby; leaves simple, erect*.—This has a weak shrubby stalk, which divides into several branches, and rises about five feet high. The leaves are three inches long, and an inch and a half broad, of a light green, and a little hairy. The peduncle is terminating, sustaining one pale fresh coloured flower. Native of Africa. Introduced 1690. It flowers from July to October, and may be increased by cuttings, planted in a shady border during the summer months.

11. *ASTEROCEPHALUS STELLATUS* (starry *Asterocephalus*). *Corolla radiant; leaves cut; receptacle of fruit roundish; outer limb of calyx broad, membranous; stem branched*.—A common hardy annual in gardens, raised not so much for the sake of its large cream-coloured flowers, as for its heads of seeds, which serve to decorate flower-pots in winter, and whose dark five-rayed inner calyx is prettily set off by the orbicular and shining outer one. Native of Spain and Barbary; flowering in July and August. Cultivated in 1596 by Gerard.

12. *ASTEROCEPHALUS OCHROLEUCUS* (pale-flowered *Asterocephalus*). *Corolla radiant; radical leaves bipinnate, with linear leaflets; cauline pinnate with perfoliate stalks*.—An ornamental perennial, the stem is round, pale green tinged with purple at the base, from a foot to three feet in height, and erect. The flowers are constantly of a pale sulphur colour, and are produced in July and August. Introduced 1739. May be propagated by seeds, and will thrive any where.

13. *ASTEROCEPHALUS GRAMUNTII* (cut-leaved *Asterocephalus*). *Calyx very short; cauline leaves bipinnate, filiform*.—It flowers very late even in November, and is perennial. The stems are a foot and a half in height. The head of flower is hemispherical, and of a deep blue colour. Native of the south of France, &c. Cultivated in 1739 by Mr. Miller.

CULTURE.—The hardy annual and

biennial species may be sown in the open borders; the tenderer sorts raised in a frame, or in the greenhouse, and when potted off, set with other greenhouse plants. The hardy perennial species thrive in the common garden soil, and increase readily by seed, which ripens in abundance. Cutting planted under a handglass will root freely

ASTRAGALUS (from *Astera* star, and *gala* milk).

Class Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Legume two-celled, or less gibbous, with the lower turned inwards; carina blunt*.

1. *ASTRAGALUS HYPOGLOTTIS* (purple milk-vetch). Eng. bot. 274. *Caululent, procumbent; leaflets oblong, blunt; spikes ovate, stalked, longer than leaf; pods erect, ovate, channelled*.—This elegant little plant abounds on dry heaths, as in the chalky tracts of Cambridgeshire, &c.; flowering throughout June and July. The roots are perennial, branched, long, slender, and creeping; stems zigzag, but little branched, set with alternate spreading pumated leaves, about six pair or more of leaflets: heads of flowers one or two on each stem, erect, axillary, solitary, scarcely longer than the leaves till after flowering. The flowers are of a beautiful purple, they sometimes vary to white.

2. *ASTRAGALUS LEONTINUS* (Lion's tail milk-vetch). Bot. cab. 432. *Caululent, decumbent; leaflets elliptical, blunt; spikes oblong, stalked longer than leaf*.—This beautiful plant is a native of Austria and Switzerland. Its stature is diminutive, the stalks lying upon the ground, and the flowers not rising more than two inches from it, in heads of from twelve or fifteen flowers or more. They come out about Midsummer. The plant is quite hardy, and will succeed very well in a pot of light loam; propagated only by seed, as the root will not divide. Introduced 1816.

3. *ASTRAGALUS ARENARIUS* (sand milk-vetch). *Caululent, branched, prostrate; leaflets linear, lanceolate, silky, complicate; racemes six-flowered, longer than leaf*.—This is a low perennial plant, which grows naturally upon hills in several parts of England, particularly in the North; seldom rising more than two or three inches high,

wing many winged leaves composed of narrow woolly lobes, placed close to the mid-rib; the flowers are pretty large, of a purple colour, growing in loose spikes. It flowers in June, and the seeds ripen in August. Should have a shady situation.

4. *ASTRALAGUS AUSTRIACUS* (Austrian milk-vetch). Jacq. a. t. 195. *Cauliscent procumbent; leaflets linear, unicate, emarginate; racemes longer than leaf, stalked; wings of corolla vivid.*—Native of Austria, in dry exposed places. The flowers are small, and without smell: they have a blue exilium, the rest purple. They appear in May and June. Introduced 1640.

5. *ASTRALAGUS SUCULENTUS* (succulent Milk-vetch). Bot. reg. t. 1324. *Leaflets 21-25, oblong, obovate, slightly marginate; racemes shorter than the leaves; bractes ovate, acute, longer than the pedicel.*—It is an unpretending, hardy, herbaceous plant, with purplish flowers, growing freely in peat, and flowering in June. Originally found by Dr. Richardson in Arctic America, but introduced into this country by Mr. Douglas in 1830.

6. *ASTROGALUS LINEARIFOLIUS* (linear-leafted Milk-vetch). Swt. fl. g. t. 73. *Leaflets linear, acute, 10-12 pairs; racemes much longer than the leaves; vexillum broad, twice the length of the wings.*—A beautiful hardy perennial plant, with rosy-lilac flowers, requiring no other treatment than to be planted in the open border, in common or garden soil, and to be kept free from weeds. In rich soil it will attain the height of two feet: flowering in July and August, and ripening its seeds by which alone it is increased; these may be sown early in spring, either in pots, or in the open ground; and as soon as the plants are two or three inches in height, they may be placed where they are to remain, watering them occasionally, and shading them a little at first, if the weather prove warm and dry. Introduced 1780.

7. *ASTRALAGUS ONOBRYCHIS* (saint-foin-like Milk-vetch). *Cauliscent diffuse; peduncles spiked; standard twice as long as flower.*—An elegant plant, a native of Syria, Persia &c. The flowers are of a beautiful purple colour, and appear in July. Introduced 1819.

8. *ASTRALAGUS CARYOCARPUS* (swelled podded Milk-vetch). Bot. reg. 176.

Peduncles longer than leaf; flowers erect, closely spiked; pods half two-celled.—It is perennial, tolerably hairy, herbaceous, and covered with a hairy nap. Stems several, first procumbent, then ascending, simple, with a waved appearance. Racemes 8-14 flowered; flowers three-fourths of an inch long, of a pale violet purple. The pod when ripe, is about the size of a nut-meg, and not unlike a stunted walnut. A native of Louisiana, flowering in June and July. Introduced 1811.

9. *ASTROGALUS PENTAGLOTIS* (five-tongued or five-podded Milk-vetch). *Cauliscent procumbent; leaflets oblong; retuse; heads stalked, shorter than leaf; pods half ovate, squamose at end.*—It flowers in the beginning of August, and bears seed at the end of the same month; the flowers are blue and white. Native of Spain and Barbary, on hills. Introduced 1739.

10. *ASTRALAGUS GLAUX* (small Spanish Milk-vetch). *Cauliscent diffuse; heads stalked, imbricated, ovate; flowers erect; pods ovate, callous, inflated.* This species is an old inhabitant of our gardens. It was cultivated by Gerard in 1596. The flowers which are of a purplish colour, are produced in June and July. Native of Spain and the south of France in arid places.

11. *ASTRALAGUS STDLLA* (star-podded Milk-vetch). *Cauliscent diffuse; heads stalked, lateral; pods straight, subulate, mucronate.*—The stems are spreading, a foot long, striated, hispid, with white crowded hairs; branches numerous; leaflets on each side of the mid-rib nine, ovate, obtuse; peduncle about the length of the leaves, supporting about fifteen bluish flowers. It is a native of Montpellier, flowering in July and August. Introduced 1630.

12. *ASTRALAGUS SESAMENS* (bird-foot Milk-vetch). *The caulescent diffuse; heads subsessile, lateral; pods erect, subulate, with a reflexed point.*—This is an annual plant, which sends out several weak stalks without any order; at the footstalks of the leaves the flowers come out in small clusters, sitting close to the sides of the stalks, they are of a copper colour, and are produced in July, and the seeds are ripe in autumn. Native of the south of France. Introduced 1616.

13. *ASTRALAGUS VESICARIUS* (bladder Milk-vetch). Bot. mag. t. 3286.

The leaves with about five pairs of elliptical opposite leaflets, and a terminal one.—In this very handsome and highly desirable species, the flowers are always of a rich purple colour, becoming darker, and almost blue in age, yet they appear in a wild state to be sometimes cream coloured or white. It is a native of barren wastes in the south of France, and of Russia, and is perfectly hardy. Flowering in May.

14. *ASTRAGALUS CONTORTUPLICATUS* (wave-podded Milk-vetch). *Caulescent procumbent, downy; leaflets obovate, emarginate; racemes stalked, urtuate, twisted.*—This plant varies wonderfully in size, according to the soil in which it grows. The flowers of a pale yellow colour, make their appearance in July and August. Native of Siberia, Hungary, &c., in grassy places. Introduced 1783.

15. *ASTRAGALUS HAMOSUS* (hook-podded Milk-vetch). *Caulescent procumbent; leaflets cuneate, emarginate; stipules oval; racemes few-flowered; peduncles longer than the leaf.*—The root is annual, the flower are of a pale yellow colour. It goes commonly under the name of *Caterpillars* in the gardens, in reference to the shape of the pods. Flowers from June to August.

16. *ASTRAGALUS EPIGLOTTIS* (sword-podded Milk-vetch). *Stem caulescent procumbent; leaflets linear, narrowed at base; heads subsessile; pods half-ovate, reflexed, downy.*—The plant is an annual, with largish flowers of a deep purple colour. It flowers in July, and ripens seed in autumn. Native of Provence, Spain, Portugal, and of mountainous woods in the Levant. Introduced 1747. The seeds should be sown on an open border in April, situated as other annuals.

17. *ASTRAGALUS BÆTICUS* (Bætian Milk-vetch). *Leaves with ten or eighteen pairs of obovate retuse leaflets; legumes prismatic, three-seeded, hooked at the apex.*—This plant is cultivated to such an extent in some parts of Germany that the seeds have become an article of commerce, like the roots of chicory and the carrot, and for the same purpose. The culture is the same as that of the common pea, with this difference, that the pods of the *Astragalus* are gathered as they ripen. Two-thirds of the seeds are mixed with one-third of coffee-beans, roasted together, put in

bottles or vases, well corked, or closed, and taken out as wanted to be ground. It is sold at the same price as *café chicoree*, which is generally about one-third part cheaper than the true coffee. It sends out several trailing branches near two feet long; at the wing of each leaf come out a footstalk, nine inches long, sustaining four or five yellow flowers at the top. They appear in July, and the seeds ripen in August, soon after which the plants decay. Introduced 1759.

18. *ASTRAGALUS STIPULATUS* (large-stipuled Milk-vetch). Bot. mag. t. 2360. *Caulescent; leaflets obovate, smooth; stipules very large, leafy.*—The root is perennial; stems herbaceous, two or three feet high; leaves remote, pinnated, five to eight inches long; leaflets distant in eight to sixteen pairs; spikes many-flowered; flowers scattered, greenish white, tinged with red; pod completely two-celled, eight to twelve-seeded, oblong, stipulate at the base.

The broad leafy stipules and the stipitate pods are the distinguishing marks of this species, which was discovered by Dr. F. Hamilton in 1802, at Gorasan, in upper Nepaul. It was raised at the Fulham nursery in the spring of 1822, from seeds, and being planted out in the open ground, flowered in September and October. Mr. Milne informs us that he thinks it will prove hardy.

19. *ASTRAGALUS CAPITATUS* (headed Milk-vetch). *Caulescent, erect; heads globose; peduncles very long; leaflets emarginate.*—Was discovered by Tournefort in the Levant, who sent the seeds to the royal garden at Paris. It hath a perennial root, which sends up several erect stalks, garnished with winged leaves, composed of several pair of lobes, indented at the top; from the wings of the leaves come out long footstalks, supporting a globular head of purple flowers; these are rarely succeeded by pods in England. It flowers at the end of July. Introduced 1759.

20. *ASTRAGALUS GLYCYPHYLLUS* (sweet Milk-vetch). Eng. bot. 203. *Caulescent prostrate; leaflets smooth, ovate, mucronate, blunt; stipules ovate, lanceolate.*—It is perennial; the stems grow prostrate among grass and bushes, which, added to the greenish hue of the whole plant, cause it to be frequently overlooked, though often extending two or three feet in length. They are

more or less zigzag, angular and striated. The leaves are alternate, consisting of about five to seven pair of roundish leaflets, with an odd one at the end, and a pair of ovate stipulæ at the base; spikes of flowers arise from the bosom of the leaves, solitary, on foot stalks, shorter than the adjoining leaf. The flowers are pale sulphur-coloured, often with a brownish tinge. Pods reddish, inflated, containing hairy seeds. The leaves when chewed have a sweetish taste, which soon changes to a nauseous bitter. Cattle are not fond of them. Found about way-sides in various parts of England; flowers in June, the seeds ripen in August.

21. *ASTRAGALUS DEPRESSUS* (depressed Milk-vetch). Bot. cab. 680. *Subcaulescent, prominent: leaflets obovate; racemes shorter than petiole; pods round, lanceolate, reflexed.*—It is a perennial plant, the branches of which are very short, and as well as the leaves, lie close to the ground. The leaves are a little villose at their edges and underneath; the flowers come out in May, upon scapes little more than an inch in length. They are sometimes succeeded by seeds in this country, by which means alone it can be multiplied. It is perfectly hardy, and may either be kept in a pot, or planted in the border in light loamy soil. A native of the south of Europe, &c. Introduced 1772.

22. *ASTRAGALUS CICER* (bladdered or chick-pea Milk-vetch). Jacq. a. t. 251. *Peduncles as long as leaves; leaflets smoothish, oblong, blunt, mucronate; stipules lanceolate; racemes stalked, longer than leaf.* This species is recommended to be grown as food for cattle. It is easily propagated by seeds which should be sown on an open border in the spring; and when the plants come up, they must be cleaned and kept free from weeds till autumn, when they should be transplanted to the place where they are to remain, and will afterwards require no other culture but to keep them clean from weeds. One or two of these plants in a garden by way of variety, may be admitted, but they have little beauty. It flowers in July, and the seeds ripen in autumn. Native of Italy, Germany, &c. Introduced 1570.

23. *ASTRAGALUS CANADENSIS* (woolly Milk-vetch). *Caulescent diffuse; pods subcylindrical, mucronate; leaflets na-*

ked beneath.—Grows naturally in most parts of North America. It hath a perennial root, which sends out many irregular stalks about two feet high; from the wings of the leaves come out the foot stalks, supporting spikes of greenish yellow flowers; they appear in July, and the seeds ripen in October. It is propagated by seeds; the plants are hardy and will live through the winter in a common bed of light earth without covering. Introduced 1732.

24. *ASTRAGALUS CAROLINIANUS* (Carolinian Milk-vetch). *Caulescent, erect; leaflets oblong, downy beneath; spikes stalked; bractes lanceolate, length of peduncle.*—It hath a perennial root, but an annual stalk, which decays in autumn; from the root arise several upright stalks three feet high, from the wings of the leaves arise the foot stalks, which are terminated by spikes of greenish yellow flowers, these appear in August, but unless the season is warm, the plants seldom ripen their seeds in England. It is propagated by seeds, which should be sown upon a moderate hot-bed in the spring; and when the plants are fit to remove, they should be each planted in a small pot filled with earth from the kitchen-garden, and plunged again into the hot-bed, to forward their making new roots; and when established in the pots, they must be inured to the open air, into which they should be removed the end of May, placing them in a sheltered situation, where they may remain till October, when they should be placed under a common frame to shelter them in winter; and in the spring they may be turned out of the pots, and planted in a warm border, where they will thrive and flower; and if the winter proves very severe, a little old tan should be laid over the roots, which will effectually preserve them.

25. *ASTRAGALUS CHINENSIS* (upright Chinese Milk-vetch). *Caulescent, erect, straight, smooth; leaflets elliptical, blunt; flowers racemose, pendulous; pods inflated, rugose.*—This plant grows naturally in China. It is annual, and flowers in July and August, and the seeds ripen in autumn. The flowers are of a purple colour. Introduced 1795.

The seeds should be sown upon a hot-bed in March, and when the plants come up and are fit to transplant, they

should be each put into a small pot filled with light earth, and plunged into another moderate hot-bed; being careful to hide them from the sun until they have taken root.

26. *ASTRAGALUS ALOPECUROIDES* (Foxtail-like Milk-vetch). Bot. mag. t. 3193. *Stem caulescent, erect; spikes cylindrical, subsessile; calyx and pods woolly.*—This is a very handsome species of *Astragalus*, with lemon-coloured flowers, and deserves a place in every collection of plants. It is perfectly hardy, yet it does not appear to be common in our gardens, though introduced from Spain so long since as the year 1737.

27. *ASTRAGALUS CHRISTIANUS* (great yellow Milk-vetch). *Stem caulescent, erect; leaflets elliptical, stalked; stipules linear, subulate; peduncles about three-flowered, axillary, clustered.*—Grows naturally in the Levant. It sends up stalks near three feet high. The flowers are large and of a bright yellow colour; they appear in July, and in very favourable seasons will perfect seeds in England. Introduced 1737.

It is propagated by seeds, which should be sown in a warm border and a dry soil, otherwise the plants will not thrive well in this climate. The third year from seed the plant will flower, and continue many years in a proper soil.

28. *ASTRAGALA VERUS* (true Tragacantha goat's-thorn). Dend. b. t. 84. *Petioles spiny; leaflets elliptical hoary; peduncles about four-flowered, as long as leaves; calyx teeth orate.*—From this plant is gathered the greater part of the Gum Tragacanth, which is imported into Europe. Tragacanth exudes from it naturally from July to September, either from wounds made in it by animals, or fissures occasioned by the force of the juice during the great heats of summer. According as the juice is more or less abundant, Tragacanth exudes in twisted filaments, which sometimes assume the form of a small worm, elongated, rounded, and compressed, rolled, upon itself or twisted. The finest and purest tragacanth assumes this form. It is almost transparent, whitish, or of a yellowish white. It also exudes in large tears, which preserve more or less of a vermicular form. This is more of a reddish colour, and more contaminated with impurities.

Tragacanth, though generally called a gum, differs very much from gum Arabic in its properties. It is opaque, white, with difficulty pulverizable, unless when thoroughly dried, and the mortar heated, or in frost, and it cannot be said to be properly soluble in water, for it absorbs a large quantity of that fluid, and increases in bulk. It is totally insoluble in alcohol. Its mucilage differs from that of gum Arabic in being precipitated by the superacetate of lead and oxymuriate of tin, and not by silicized potass, or the oxymuriate of iron.

In pharmacy gum Tragacanth is employed for forming powders into troches, and rendering them tough cohesive substances, by beating them with mucilage of tragacanth, and then drying the mass. For electuaries it is improper, as it renders them spiny on keeping. It is also an improper adjunct to active powders, as it swells up on attempting to mix them with water. It is a demulcent, and may answer the purposes of gum Arabic, being better adapted for allaying tickling cough, and sheathing the fauces in catarrhal affection, owing to its great viscosity. Introduced 1640.

Increased by seeds or by slips. They should be planted on a very moderate hot-bed, which must be covered with mats, to screen them from the heat of the sun by day and the cold by night. On this bed they may remain until the following spring, when they should be transplanted, either into pots filled with light sandy earth, or into warm borders where, if the soil be dry, gravelly, and poor, they will endure almost the severest cold of our climate, but if planted in a very rich soil, will often decay in winter.

29. *ASTRAGALUS BREVIFLORUS* (short flowered Goat's-thorn). *Leaves with six-seven pairs of lanceolate villous leaflets.*—A native or Armenia: raised from seed in 1825. It is a low shrubby plant, growing slowly, not much exceeding six inches from the ground. It is quite hardy, flowering in June; will thrive in light loamy soil.

30. *ASTRAGALUS ARISTATUS* (awed Milk-vetch). *Petioles shining; leaflets oblong, mucronate, hairy; peduncles very short, about four-flowered; calyx teeth setaceous.*—This is a low herbaceous plant, a native of the Alps

and Pyrenees, where it is found growing in barren places.

With us it flowers in June, and sometimes perfects its seeds, by which alone it can be increased: It is quite hardy enough to endure our winters, but like most of this interesting genus is not long lived.

We have kept it very well in a small pot, in light, loamy earth, and fully exposed to the sun.

31. *ASTRAGALUS MONSPESSULANUS* (Montpelier Milk-vetch). Bot. mag. t. 175. *Stemless; leaflets elliptical, blunt, scape racemose, declinate longer than leaf; standard long.*—The brilliant colours which the blossoms, but more especially the flower-cups of the present species exhibits, justly entitle it to a place in the flower garden. The best situation for this plant is an elevated one, among rock-work, where its flowering stems may hang down. Thus its blossoms are displayed to greater advantage, and not so liable to be disfigured as when lying on the ground.

It is a native of the south of France, is hardy perennial, of ready growth; flowers early in July, and will ripen its seeds; by these the plant is most advantageously increased; It may also be raised from cuttings of the stalks. Introduced 1776.

32. *ASTRAGALUS INCANUS* (hoary milk-vetch). *Stemless; scapes decumbent; leaflets ovate, subsessile, downy beneath; pods hairy.*—A biennial plant, seldom more than six inches high; the root-stalks arise from the wings of the leaves, supporting three or four pale flowers which are succeeded by sickle-shaped pods. It grows naturally on the hills near Verona. Introduced 1759.

33. *ASTRAGALUS BRACHYCALPUS* (short-fruited Milk-vetch). Bot. mag.

2335. *Stemless; leaves elliptical, downy; scapes racemose; longer than leaf; pods obovate, the length of calyx.*—Its native soil this species is both of umbler growth and more pubescent than in its cultivated state. It approaches near to *A. Monspeulanus*, but as has rounder leaflets, is more erect, and the legumen scarcely exceeds the calyx in length. It is a native of Caucasus near the hot baths, flowering in May. Introduced 1820.

34. *ASTRAGALUS PHYROIDES* (inflated milk-vetch). *Stemless; leaflets ovate, laucous scopes longer than leaf; flow-*

ers capitate; pods inflated, membranous, smooth.—Perennial, flowers yellow; requires a shady situation. Native of Siberia. Introduced 1759.

CULTURE.—*Astragalus* is a handsome genus containing more than three hundred species. Most of the species thrive well in common garden soil; and are increased by seeds, which ripen in abundance; a few are more tender than the others; the seeds should be sown on a gentle hot-bed, and the plants when of sufficient size, planted out in the flower-borders, where they will flower and ripen their seed.

ASTRANTHUS (named from the star-like disposition of the segments of the flower).

Class Heptandria Tetragynia. Nat. Ord. *Homalinæ*.

The Characters are—*Calyx 0; corolla hypocrateriform, with one cleft limb; seed one, small, superior.*

ASTRANTHUS COCHINCHINENSIS (Chinese Star-flower). Bot. mag. 2659. *Leaves ovate, lanceolate, serrated.*—A small Chinese bush with serrated leaves and spikes of pale whitish green flowers. It blooms in June, and requires the protection of a stove. Is readily increased by cuttings, planted in rich mould.

ASTRANTIA.

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Umbels fascicled; involucre as long as umbels; fruit oblong, surrounded by furrowed, wrinkled little bladders.*

1. *ASTRANTIA MAXIMA* (hellebore-leaved *Astrantia* or Master-wort). Bot. mag. t. 1553. *Radical leaves palmate, three-lobed unequally, twice serrated; cauline sessile lobed; involucre longer than umbel.*—A hardy herbaceous perennial; native of the highest mountains of Iberian Caucasus; flowering in June and July. The whole flowers possesses brighter colours than the major or minor, and is therefore considerably more ornamental than either. It loves a moist soil and rather shady situation, is propagated by parting its roots, and by seeds. Introduced 1804.

2. *ASTRANTIA MINOR* (small *Astrantia*). Bot. cab. t. 93. *Radical leaves digitate; leaflets about seven, lanceolate, acute, deeply toothed.*—This, at first sight, differs from *A. major* principally in size, but is essentially different in se

veral other respects. It is much more rare, not only in the gardens, but even on the Alps, being chiefly found in the most elevated situations in the neighbourhood of the glaciers, growing in moist black earth, under the shade of abrupt precipices or surrounding shrubs and flowering in August and September. Introduced 1686.

3. *ASTRANTIA MAJOR* [great black Astrantia]. Ex. bot. t. 76. *Radical leaves five-lobed; lobes trifid, acute, toothed; involucre linear, lanceolate, entire.*—This species is not uncommon in Alpine meadows and pastures; particularly such as are moist and near water; flowering in August. The root is perennial, tuberous, externally black, of a pungent aromatic flavour, and stimulating cathartic quality. Stem a foot and a half or two feet high, upright, furrowed, smooth, almost leafless; leaves of a shining deep green; umbel on somewhat corymbose or panicled stalks, accompanied by variously-lobed, partly coloured, and prettily veined bracteas. Involucrum white, with a purplish tinge, veined, and tipped with green.

The elegant Haller was very partial to this plant, and has celebrated it in his poem called the Alps.

It is easily cultivated, thriving well on a rich and rather moist border,

4. *ASTRANTIA CARNILICA* (Carniolian Astrantia). *Radical leaves five-lobed; lobes oblong, acutish, trifid; mucronate, toothed; involucre entire.* The whole plant is smooth. The root is nearly of the thickness of the little finger, about an inch long, pramorse, dark brown, having first an aromatic, but afterwards nauseous and acrid tastes. Native of Carniola, flowering in July and August. Introduced 1586.

ASTRAPÆA.

Class Monodelphia Decandria. Nat. Ord. *Butneriaceæ*.

The Characters are—*Flowers umbelate, with an involucre; involucre many leaved, unequal; calyx simple, five-leaved with one bracte; petals 5, convolute closed; stamens 25, united into a tube bearing the corolla, five sterile.*

ASTRAPÆA WALLICHII (Wallich's Astrapæa). Bot. mag. t. 2502. *Leaves roundish, cordate, acuminate, very large; stipules large, persistent, ovate, wavy.*—Supposed to be a native of Madagascar, but was first sent from this country

by the indefatigable Dr. Wallich, whose valued name it bears. It grows to a small tree, with spreading branches and leaves frequently more than a foot in diameter, forming a fine shade.

Its noble splendid-coloured flowers are produced in the winter months in large pendulous bunches. It may be increased by cuttings, and should be potted in loam and peat, and preserved in the stove.

ASTROLOBIUM (from *astron*, a star, and *lobos*, a pod; in reference to the disposition of the pods like the rays of a star).

Class Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*The calyx five-toothed; keel small, compressed; legume rather terete, many jointed.*

1. *ASTROLOBIUM EBRACTEATUM* [brackless Star-vetch]. *Flowers somewhat capitate, naked; leaves pinnate; legume incurved, cylindrical, with obsolete joints.*—A native of the south of France, &c. in gravelly places; the flowers are small and of a yellow colour; they appear in June and July. Introduced 1700.

2. *ASTROLOBIUM DURUM* [hard podded Star-vetch]. *Stipules concrete; sheathing; lower leaves simple, the rest pinnate, with a few pairs of obcordate leaflets; legumes arched, rather tetragonal.*—Native of hills in Spain, and of Portugal in vineyards, flowering in May and June; the flowers are deep yellow, two or three on each stalk, unaccompanied by a leaf. Introduced 1816.

3. *ASTROLOBIUM REPANDUM* [repand podded Star-vetch]. *Lower leaves simple, ovate, emarginate, upper ones pinnate; legumes rather nodose, incurved.* Native of Barbary, flowers yellow. They are produced in June and July. Introduced 1805.

5. *ASTROLOBIUM SCORPIOIDES* [Purslane leaved Star-vetch]. *Leaves ternate, subsessile, the old one very large.* This species differs from all the former in the great size of its terminal leaflets, and the round kidney-shape of the only pair of lateral ones. The flowers are yellow, and stand upon slender peduncles. The legumes are about two inches in length. Native of the south of Europe, among corn, and on the borders of fields; flowering in June and July. The whole of the herbage is *gumous*

and rather succulent. No leaf accompanies the flowers. Introduced 1596.

CULTURE.—The plants of this genus have no great beauty, yet are curious on account of their jointed pods. The seeds only require to be sown in the spring, upon a bed of light fresh earth, where they are to remain. They are annual plants, and perish soon after the seeds are ripe.

ASTROLOMA.

Class Pentandria Monogynia. Nat. Ord. *Epacrideæ*.

The Characters are—*Drupe juiceless, with a solid bony putamen; calyx with four or more bractæ; corolla ventricose, twice as long as calyx, with five bundles of hairs inside, and a short spreading bearded limb; filaments linear, included.*

1. *ASTROLOMA HUMIFUSUM* (juniper-leaved *Astroloma*). Bot mag. 1439. *Prostrate, much-branched; leaves lanceolate, linear, convex above, ciliated at edge.*

A native of New South Wales, introduced about the year 1807: it is a low bushy heath-like shrub, producing flowers during the spring and summer: they are sometimes succeeded by seed, by which alone it can be increased. It requires the green-house in winter, and should be potted in sandy peat earth.

ASTRONIUM (from *Astron*, a star, in allusion to the shape of the calyx when expanded).

Class Dioecia Pentandria. Nat. Ord. *Terebinthaceæ*.

The Characters are—*Flowers Dioecious; calyx of five-coloured sepals; petals five; glands five in the disk; stamens five; ovary one; styles three, reflexed; pericarp membranous, one-seeded.*

ASTRONIUM GRAVEOLENS (strong-scented *Astronium*). *Leaflets three-pairs, with an odd one, stalked, ovate, acuminate, a little serrated.*—A small tree, native of Carthagera, in woods, &c. Every part of it abounds with a nauseous, clammy turpentine juice. After the fruit in the female plants, and the flowers in the male plants have fallen off, new branches are put forth. Introduced 1826.

CULTURE.—Ripened cuttings will root in sand under a hand-glass in heat.

ATHAMANTA.

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Fruit ribbed, ovate, hairy; styles short; calyx lanceolate, acute, incurved; petals inversely heart-shaped, broadly pointed, equal; floral receptacle 0; flowers imperfectly separated.*

1. *ATHAMANTA SIBIRICA* (Siberian Spignell). G. sib. t. 40. f. 1, 2. *Leaves pinnate, cut, angular.*—The stem is two feet high, round and scarcely streaked; flowers; red underneath; they are produced in August. Native of Siberia. Introduced 1771.

2. *ATHAMANTA CONDENSATA* (close-headed Spignell). Gouan. t. 26. *Leaves subpinnate; leaflets imbricated downwards; umbel lens-shaped.*—The stem is simple, a foot high. It flowers in July, August, and September. A native of Siberia. May be increased by seed or by dividing the root, planting them in common garden soil. Introduced 1778.

3. *ATHAMANTA INCANA* (hairy Spignell). *Leaves supra-decompound; leaflets wedge-shaped, four-toothed; umbel with many rays globose.*—A hardy perennial. Native of Siberia, flowering in July. It is about two feet in height, and is readily increased by dividing the roots. Introduced 1802.

4. *ATHAMANTA SICULA* (Flix-weed leaved Spignell). *Lower leaves shining; first umbels subsessile; seeds hairy.*—This is a perennial plant, sending up from the root several upright stems, nearly three feet high. The flowers are white. It is a native of Sicily. Introduced 1686.

5. *ATHAMANTA CRETENSIS* (candy-carrot Spignell). *Leaves linear, flat, hairy; petals divided; seeds oblong, hairy.*—The whole plant is villose in a wild state; when cultivated in a garden, the leaves become succulent, brittle, and very shining. Petals white. It is a native of the southern parts of Europe, flowering in June. The seeds have been used as carminatives and are supposed to be diuretics and emmenagogues. It was celebrated anciently as a specific for the stone, and it will scarcely be credited, that Van Helmont seriously affirms, that it has even cured the water in a well of this disorder.

6. *ATHAMANTA MACEDONICA* (Macedonian Spignell). *Leaves rhomb-ovate, cut-toothed; teeth acuminate; umbels numerous; seeds hairy.*—Native of Greece and Barbary, and probably of

the East Indies: it flowers with us in July. In warm countries it is biennial, but in England the plants seldom flower till the third or fourth year from seed, but whenever they flower they always die.

In some parts of the East this plant is used to scent clothes; the smell is strong, and in general disagreeable to Europeans.

The plant, but especially the seed, is esteemed to be diuretic, emmenagogue, and carminative; the seeds are an ingredient in Theriaca.

It is propagated by seeds, which should be sown on a bed of light sandy earth, either early in autumn or in April; when the plants come up, they will require no other care than to be kept clean from weeds, and sheltered under a frame in winter.

ATHANASIA.

Class Syngenesia Æqualis. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle paleaceous; pappus paleaceous, very short; involucre imbricated.*

1. *ATHANASIA ANNUA* (annual Athanasia). Bot. mag. t. 2276. *Corymbs simple, contracted; leaves pinnatifid, toothed.*—*Athanasia Annua*, though not very ornamental, from its rambling growth, or possessed of any sweet scent, has the property of lasting long in flower in so remarkable a degree, that RAY thought it merited its name of *Ageratum*, signifying in Greek that which is not subject to grow old, better than any other plant with which he was acquainted; the same flowers which expanded in the beginning of July, being still in full vigour at the time he wrote, on the 20th of October.

This quality, as it also lives well in water, renders it rather desirable for mixing with other flowers in vases for adorning rooms, a purpose to which its golden yellow heads, growing on long footstalks, seem well adapted. Native of Barbary. Introduced 1686.

2. *ATHANASIA PARVIFLORA* (small flowered Athanasia). *Leaves pinnated; pinnae linear, smooth; panicle decomposed.*—It has a thick shrubby stem, covered with a gray bark, and rises eight feet high, sending out many branches on every side; the leaves sit close to them, and they are terminated by close, large, roundish bunches of bright yellow flowers; they appear the

beginning of July, and continue in succession till late in autumn; those which come early in the season will ripen their seeds in winter. A native of the Cape. Introduced 1731.

3. *ATHANASIA CRITHMIFOLIA* (samphire leaved Athanasia). *Leaves trifid with linear, smooth segments; flowers somewhat in umbels.*—The stem is shrubby, with many irregular branches. The flowers are of a bright yellow colour, and there is a succession on the same plant great part of the summer; but unless the season is warm, they are rarely succeeded by ripe seeds in England. A native of the Cape of Good Hope. Introduced 1723.

4. *ATHANASIA TRIPURCATA* (trifid-leaved Athanasia). *Cuneiform, cut trifid; flowers in umbels.*—In this species the stem is shrubby, five or six feet high, dividing into many irregular branches. The leaves have an agreeable odour when bruised. The flowers are of a bright yellow colour, and appear in August, but are seldom succeeded by ripe seeds. Introduced 1714.

CULTURE.—The perennial Cape species will thrive well in a light loamy soil, or a mixture of loam and peat. Cuttings root readily under a hand-glass, shading them in the heat of the day, and refreshing them with water when they require it; and in two months they may be taken up, and planted in pots filled with light earth, and placed in a shady situation until they have taken new root: they should be placed under a hot-bed frame in winter.

ATHRIXIA.

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Heads radiant; involucre oblong, imbricated, armed, squarrose; florets bilabiate; pappus feathery; receptacle alveolate.*

ATHRIXIA CAPENSIS (Cape Athrixia). Bot. reg. t. 681. *Leaves lanceolate, stiff, alternate.*—A rare and pretty greenhouse shrub, about three feet high, from the Cape of Good Hope, with bright crimson solitary heads of flowers rather more than an inch in diameter. The leaves are dark green above and rough along the reflex circumference, cottony and milk-white underneath. It is readily increased by cuttings, which succeed best in loam and peat. Introduced 1821.

ATMOSPHERE (of 'Αἶψα, a vapour, and Σφαῖρα, Gr. a sphere) is an appendage of the earth, which consists of a thin, fluid, elastic substance, called air, surrounding the terraqueous globe to a considerable height.

The whole mass, or assemblage of ambient air, is commonly understood to be the atmosphere.

But the more accurate writers retain the term atmosphere to that part of the air which is next to the earth, which receives the vapours and exhalations, and which is terminated by the refraction of the light of the sun.

Those spaces that are higher, and beyond these, are called ether; and being supposed to be possessed by a finer substance, are called the ethereal regions, though these, perhaps, are not destitute of air.

This atmosphere insinuates itself into all the vacuities of bodies, and by that means becomes the great spring of most of the mutations here below; as generation, corruption, dissolution of vegetables, &c.; to the pressure of the atmosphere, plants owe their vegetation, as well as animals do their respiration, circulation, and nutrition.

ATRAGENE.

Class Polyandria Polygamia. Nat. Ord. *Ranunculaceæ*.

The Characters are—*Calyx four-lobed; petals 12; seeds tailed.*

1. **ATRAGENE AUSTRIACA** (Austrian atragene). Bot. rep. t. 180. *Nectarries bluse*.—It is a hardy climbing shrub, growing frequently, eight or ten feet in a season, and covers itself pretty abundantly with foliage, the footstalks of the old leaves becoming tendrils, and the wood growing to a considerable thickness. The flowers begin to appear about May, and continue in succession till July. It may be propagated by layers; but the surest mode is by seed, which may be sown as soon as ripe, and which will be perfected from the first sowing by August. It grows the most flourishing in light rich earth, but will live in the most common. Introduced 792.

2. **ATRAGENE SIBIRICA** (Siberian atragene). Bot. mag. t. 1951. *Nectarries emarginate*.—Native of Siberia, where it grows in the mountainous districts nearly as far as the Eastern Ocean, covering the shrubs, and underwood, in the same manner as our Tra-

veller's-Joy, flowering profusely in June, and in the autumn delighting the eye with its clusters of white feathery seeds. With us it is usually in flower in February or March, and coming out so early, is very subject to be injured by frost.

It may be increased by layers or seeds, and forms a suitable climber for a wall or other support. It will grow in any good garden soil.

3. **ATRAGENE AMERICANA** (American Atragene). Bot. mag. t. 887. *Nectarries acute*.—This plant flowers nearly at the same time as *A. austriaca*, a month later than *Sibirica*, is hardly less ornamental, and has the exclusive advantage of being agreeably scented. It is perfectly hardy, and produces seeds freely, by which it may be propagated without difficulty, and makes a very desirable addition to our climbing shrubs.

ATRAPHAXIS.

Class Hexandria Digynia. Nat. Ord. *Polygonaceæ*.

The Characters are—*Calyx two-leaved; petals 2, sinuated; stigmas capitate; seed 1.*

1. **ATRAPHAXIS SPINOSA** (prickly Atraphaxis). Wat. dend. B. 119. *Prickly*.—An elegant flowering undershrub, with a woody, branching, rufous root, depositing its outer skin in irregular pieces. Stem woody, diffused, branching, from two to four feet high, ending in a horny spine. The flowers come out at the ends of the shoots in clusters, each consisting of two white petals tinged with purple, included in a two leaved calyx, of a white herbaceous colour. They appear in August. Native of Siberia, Armenia, and Persia. Cultivated by Mr. Miller in 1759.

2. **ATRAPHAXIS UNDULATA** (waved leaved Atraphaxis). *Unarmed; leaves wavy*.—It sends out many slender branches, trailing on the ground, scarcely a foot long. The leaves are about the size of those of knot-grass, waved and curled on their edges, half stem clasping. Flowers in oblong spikes, somewhat leafy at the ends of the stem and branches, having ovate, sharpish bractes between them, shorter than the flowers; calyx yellow; seed very dark purple, shining. It flowers in June and July. Native of the Cape. Introduced 1732.

CULTURE.—Cuttings root freely in sand under a glass.

ATRIPLEX.

Class Polygamia Monœcia. Nat. Ord. *Chenopodææ*.

The Characters are—*Perfect flower; perianth single, five-parted, inferior; stamina 5; style bipartite, fruit depressed, one-seeded, covered by the calyx; pistilliferous flower; perianth single, two-partite; stamens 0. The rest as in the perfect flower.*

1. *ATRIPLEX PORTULACOIDES* (shrubby Orache, or Sea Purslane). Eng. bot. t. 261. *Stem shrubby; leaves obovate.*—The whole plant is of a silvery glaucous hue, not inelegant; the leaves when dry are finely dotted beneath. The juices abound with alkaline salts. Dense clusters of yellow flowers in compound spikes terminate the stem and branches. It is abundant on the sea-shore in a clay soil, flowering in the latter part of summer. It may be introduced into plantations among other low shrubs, and if planted in a poor gravelly soil, will abide several years, and make a pretty diversity. Cuttings strike root readily, under a common hand-glass.

2. *ATRIPLEX PEDUNCULATA* (pedunculated sea Orache). Eng. bot. t. 232. *Stem herbaceous, with divaricating branches; leaves lanceolate, obtuse, undivided; fruit of the female flowers on footstalks.*—No obscurity envelopes this species. The pedunculated fruit distinguishes it at first sight. In a young state it is known by being herbaceous. The whole herb is glaucous, clothed with a scaly mealliness. It grows in salt marshes near Yarmouth, and flowers in August and September.

3. *ATRIPLEX PATULA* (spreading halberd-leaved Orache). Eng. bot. t. 936. *Stem herbaceous, spreading; leaves triangular-lanceolate, somewhat halberd-shaped; calyx of the fruit more or less tuberculated at side.*—It grows every where on dunghills, waste or cultivated land, flowering from June to August. The root is always annual, and fibrous. The clusters of flowers are terminal and axillary, long, interrupted, and a little leafy.

By the sea-side the whole plant is procumbent, more fleshy, reddish, and all the leaves sometimes entire.

4. *ATRIPLEX ERECTA* (upright spear-leaved Orache). Eng. bot. t. 2223. *Stem herbaceous, erect; leaves ovate, lanceolate; the lower ones sinuated;*

calyx of the fruit all over mucricated.—It is known by its upright stem, which is much branched and panicled in the upper part, and especially by the very abundant and crowded fruit, all over strongly armed with prominent tubercles.

5. *ATRIPLEX LITTORALIS* (grass-leaved sea Orache). Eng. bot. t. 708. *Stem herbaceous, erect; leaves all linear, entire, toothed; calyx of the female flowers mucricated, sinuated.*—Not unfrequent on the eastern and southern coasts of this kingdom in a muddy soil, flowering in August and September. The under side of the leaves, as well as the flowers and young branches, are covered with a mealy hoariness. The leaves turn black in drying, like many other sea plants.

6. *ATRIPLEX ANGUSTIFOLIA* (spreading narrow-leaved Orache). Eng. bot. t. 774. *Stem herbaceous, spreading; leaves lanceolate, entire; the lower ones somewhat hastate; calyx of the fruit hastate, slightly tuberculated at the sides.*—Extremely common in the autumn about dunghills, hedges, and waste ground. It is conspicuous for its long straight divaricated branches, laden, towards the close of the year, with the peculiar enlarged calyces, by which an *Atriplex* is known from a *Chenopodium*.

7. *ATRIPLEX HALIMUS* (tall shrubby Orache). Per. thea. 724. f. 2. *Stem shrubby; leaves alternate or opposite, oblong, subrhomboid, entire.*—It grows in hedges near the sea, about Nice, also in Spain, Portugal, and Sicily; Ray says that he found it in great plenty about Messina. Although this shrub is not proper for hedges, for which it was introduced, it may have a place in wilderness quarters, where it will serve to thicken, and the silver coloured leaves will add to the variety, among other shrubs of the same growth.

It will attain to eight or ten feet in height, and if suffered to grow wild without pruning, will spread several feet in compass, and sometimes produce flowers. May be increased by cuttings, planted in any of the summer months on a shady border.

8. *ATRIPLEX HORTENSIS* (garden Orache). *Stem herbaceous, erect; leaves triangular-toothed, whole coloured; calyx of fruit ovate, netted, entire.*—It was formerly much cultivated in

he kitchen-garden as a culinary herb, being used as spinach, and is now by some persons preferred to it. Where it is sown on a rich soil, and the plants are allowed a proper distance, the leaves will be very large, and in that the excellency of the herb consists. It must be eaten when young, for when the stalks become tough, it is good for nothing. The seeds will ripen in August, when the plants may be cut, or pulled up, and laid on a cloth to dry; after which the seeds may be beaten out, and laid up in bags for use. A native of Tartary. Introduced 1548.

This species is propagated by seeds, which may be sown early in the spring, or soon after the seeds are ripe, at which time it generally succeeds better than when it is sown in the spring, and will be fit for use at least a month earlier. These plants require no other culture, but to hoe them when they are about an inch high, to cut them down when they are too thick, leaving them about four inches asunder, and also to cut down all the weeds.

ATROPA (a mythological name; *Atropos* was one of the Fates, and it was her especial duty to cut the thread of human life. The fruit of this genus is well adapted to fulfilling her office).

Class Pentandria Monogynia. Nat. Ord. *Solaneæ*.

The Characters are—*Corolla campanulate; stamens distant; berry globose, two-celled, sitting in the calyx.*

ATROPA BELLADONNA (deadly Nightshade). Eng. bot. t. 592. *Stem herbaceous; leaves ovate, entire.*—It has a branching stem, with the root leaves often a foot long and five inches broad, and the whole plant is more or less tinged with purple; the flowers are void of scent, the berries are larger than cherries, at first green, but when ripe, of a beautiful shining black colour, full of purple juice, with roundish dotted channelled seeds. When this plant was found to differ from the *Solanums* or Nightshades, it assumed the Italian name of *Belladonna*, which was given it, according to some, because it was used as a wash among the ladies, to take off pimples and other excrecences from the skin; or, according to others, from its quality of representing phantasms of beautiful women to the disturbed imagination.

The ingenious Dr. Milne, in his *Indi-*

genous Botany, has very properly remarked that nature has been more parsimonious in her warnings with respect to this plant, than to others of the same natural family. Neither the smell nor the taste is offensive; and if the colour of the flowers prove in some degree a repellant, that of the fruit, on the other hand, is in an equal degree, at least, attractive and inviting. Hence children have frequently fallen victims to their deleterious effects.

The qualities of this plant are malignant, and it is extremely poisonous in all its parts. Numerous instances have occurred of the berries proving fatal, after causing convulsions, delirium, &c. Buchanan relates the destruction of the army of Sweno the Dane, when he invaded Scotland, by the berries of this plant which were mixed with the drink which the Scots, according to the truce, were to supply the Danes with. The Danes became so inebriated that the Scottish army fell on them in their sleep, and slew such numbers that there were scarcely men enough left to carry off their king.

The case related by Mr. Ray is remarkable, viz. the dilatation of the pupil of the eye, caused by a part of a leaf of this plant applied outwardly, and which took place successively on the repetition of the experiment.

Under the influence of this poison the sensibility of the stomach is greatly decreased, and emetics lose much of their usual power. The stomach pump and sulphate of zinc should first be resorted to, vinegar afterwards is recommended to be drank freely, for relieving the system.

Its medicinal properties, applied both internally and externally, have been found efficacious in cancerous and scrophulous sores and tumours.

This plant is a native of Europe, particularly of Austria and England, in church-yards and on dunghills, skulking in gloomy lanes, and uncultivated places; in other countries, it is said to be common in woods and hedges. It may be propagated both by its roots and by seeds. It loves a shady situation, but on account of its deadly poison, is rarely admitted into gardens.

ATTALÆA.

Class Monœcia Polyandria. Nat. Ord. *Palmeæ*.

The Characters are—*Monoica in*

eodem spadice; spatha simplex; flores sessiles, bracteolatimas; calyx tripartitus aut triphyllus, foliolis coalitis; corolla tripetala; stamina numerosa, decem ad viginti quatuor; rudimentum pistilli, FEM calyx triphyllus; corolla tripetala; cupula annularis, ovarium ambieus; ovarium triloculare, (rarius quadri vel-quinqueloculare); stigmata tria, (rarius quatuor vel quinque) sessilia; drupa trilocularis, rarius quadri vel-quinquelocularis) loculis monospermis; putamen basi triporum, (rarius quadri vel-quinqueporum; albumen aquabile; embryo basilaris (Martius).

1. *ATTALEA COMPTA* (decked Attalea). Mart. p. t. 41. *Drupe obovate, beaked.*—This species forms delightful groves in the interior of the country, growing from twenty to fifty feet clear of its branch-like leaves. The latter are from fifteen to twenty feet long, and about three feet wide. They form an excellent thatch, and are woven into hats, mats, baskets, &c. The fruit is about three inches in length, and contains an eatable kernel, to which the natives are extremely partial. Introduced 1823.

2. *ATTALEA FUNIFERA* (rope-bearing Attalea). Mart. palm, t. 95, 96. f. 4. *Drupe elliptical.*—This species is found in the native forests of the maritime provinces of Brazil. It rarely exceeds twenty to thirty feet in height. The fronds are generally from fifteen to twenty feet in length, and the leaflets three feet long.

The best cordage in South America is manufactured from the fibres of the leafstalks and other parts; such ropes are of great strength, and are extremely durable in salt water; they are much used for naval purposes, no other cables being employed in a great part of the Brazilian navy. Introduced 1823.

3. *ATTALEA EXCELSA* (lofty Attalea). Mart. *Drupe oblong, sub-pentagonal, acute.*—The stem is upwards of one hundred feet in height, and frequently a foot and a half thick. Fronds erect-patent. Native of Para. Introduced 1824.

4. *ATTALEA SPECIOSA* (handsome Attalea). *Drupe ovate, oblong, conical, naked.*—The nuts of this species the Brazilians burn, for the purpose of smoking the juice of *Siphoni elastica*, or Indian Rubber, until it becomes black. Native of Para. Introduced 1824.

5. *ATTALEA SPECTABILIS* (showy Attalea). Mart. palm. t. 96. f. 1 and 2. *Drupe ovate, umbonate.*—This palm varies much in appearance; it is found sometimes without a stem, and at other times with one—two, three, and even four feet in height, nearly a foot in thickness, and of a brownish-red colour. Fronds interior, erect; exterior erect-patent, eight to twenty feet long. The pinnæ make a very neat appearance: they are numerous, sub-pectinate patent. Those beneath are remote, and alternate, those above sub-opposite, and five to six spans long. Native of Para, where it was observed by Martius, bearing both fruit and male flowers in the months of March and April. Introduced 1824.

CULTURE.—Attalea is a genus of Palms consisting of lofty or middle-sized or even occasionally stemless species, with a thickish trunk, the wood of which is soft and of a reddish brown colour, it is irregularly marked externally with scars, and is terminated by large pinnated leaves, the stalks of which are broad and the segments smoothish, rather thick, plain, and neat looking. The bunches of fruit are simply branched, but are often of a vast size, and hang down from the bottom of the leaves, covered with brownish nuts, the seeds of which are eatable.

They are found, according to Von Martius (the great illustrator of this noble family), chiefly in the tropical parts of America, where they occupy the richest soil and the hottest forests, rarely ascending the sides of mountains, or spreading from the woods into the open country. All the species are stove plants, requiring sandy loam to thrive in, and are only to be increased by seed.

AUBRIETIA.

Class Tetradynanica Siliculosa. Nat. Ord. Cruciferae.

The Characters are—*Silicle oblong, with convex valves; seeds not edged; calyx bisaccate at base; petals entire.*

1. *AUBRIETIA DELTOIDEA* (spreading Aubrietia). Bot. mag. t. 128. *Pedicels longer than calyx.*—It is properly a rock-plant, being hardy, forming with very little care a neat tuft of flowers, and not apt to encroach on its neighbours: begins to flower in March, and continues to blossom through April, May and June, and, if favourably situ-

ted, during most of the summer. Is a native of the Levant. May be propagated by parting its roots in autumn, or by cuttings. Introduced 1739.

2. *AUBRIETIA PURPUREA* (tufted aubrietia). Swt. b. fl. g. t. 207. *The leaves are scattered, very much crowded, blong, obtuse, attenuated at the base into kind of footstalk, pubescent.*—This pretty little perennial hardy spring plant is one that is well adapted for artificial rock-work, where it forms dense tufts, but make a fine appearance, when covered with its purple lilac flowers, which it produces plentifully in April.

It may be increased without difficulty by separating the roots. Native of the south of Europe. Introduced 1821.

AUCUBA.

Class Diœcia Tetrandia. Nat. Ord. *Loranthææ*.

The Characters are—*MALE.*—*Calyx four-toothed; petals four; receptacle with a square hole.* *FEMALE.*—*Calyx four-toothed; petals four; ovary inferior; style one, short; nut ovate, one-elled.*

AUCUBA JAPONICA (blotch-leaved Aucuba). Bot. mag. t. 1197. *Leaves aggregate at the tops of the branches, petiolate, opposite, oblong, sharp, revotely serrate, smooth, curved.*—The Aucuba, of which one species only is known to us, grows into a large tree, and is very much cultivated in Japan for the beauty of its foliage; for we do not know that it is applied to any use. We are informed by Thunberg, that it arises with leaves of a plain brownish green colour, and of a lively green, variegated with white.

The fruit, according to Kœmpfer, is an live-shaped berry, with thin sweetish tasted flesh, enclosing a nut with a very nauseous kernel.

It flowers with us from May to July, but does not produce fruit. Introduced in 1783, and is now become very common, being easily propagated by cuttings or layers, and requiring no peculiarity of management or soil.

AUDIBERTIA.

Class Diandria Monogynia. Nat. Ord. *Labiataæ* Juss.

The Characters are—*Calyx ovatus, ilabiatus; corolla tubus exsertus; stamina fertilia 2, exserta; antheræ didiadatæ, connectivo elongato, filiformi, postice in filamentum articulat.* Benham.

AUDIBERTIA INCANA (hoary Audibertia). Bot. reg. 1469. *The leaves obovate, cuneate, obtuse, entire; racemes terminal, simple.*—It forms an inelegant plant, about a foot and a half high, flowering from July to September. It is quite hardy, grows readily in common garden soil, but is not propagated readily by cuttings. Native on the plains of the Colombia, and on the clayey hills near the Big Birch. Introduced by Mr. Douglas in 1829.

AULAX.

Class Diœcia Tetrandia. Nat. Ord. *Proteaceæ*.

The Characters are—*MALE.*—*Flowers racemose; calyx 0; petals four, stamiferous.*—*FEMALE, Stigma oblique; nut exserted, ventricose; bearded.*

1. *AULAX UMBELLATA* (umbelled Aulax). Bot. reg. t. 1015. *Leaves flat spatulate, linear.*—The plant seldom grows higher than three feet, and does not make many branches; but is of a lively green colour, both leaves and stems. It is very hardy, and not at all subject to the very common fate of its congeners; that is, to damp in the leaves, or rot at the root in winter. Is propagated by cuttings, to be made in the month of April or May. The flowers are pale yellow, and exhale a slight honey-like odour. The female of this species is figured in the Bot. Rep. t. 248.

2. *AULAX PINIFOLIA* (pine-leaved Aulax). Bot. rep. t. 76. *Leaves filiform, channelled.*—The Pine-leaved Aulax from the Cape of Good Hope, is rather a delicate plant, and is subject to be killed, if not kept in the driest and warmest part of the greenhouse, being very susceptible of damps. It makes a very fine appearance when in bloom, growing to the height of two feet or more upright, and with few branches; every part of the plant is quite smooth and shining. It flowers in August, and is propagated by cuttings. The soil it loves most is a light loam. Introduced 1780.

CULTURE.—Aulax, Sweet observes, is "a pretty genus, which thrives best in a very sandy loam, with a great many potsherds broken small at the bottom of the pot, to let the water drain off freely; as they frequently get too much water, which makes the mould sodden, and stagnates their growth. Ripened cuttings, taken off at a joint, and planted

in a pot of sand, will strike root, if placed under a hand-glass in the propagating house, and the glass to be occasionally left off, an hour or two at a time, to give them air, and keep them from damping, which should be done of a morning before the sun has much power, or it will make them flag, and injure them. Plants are readily raised from seeds, which should be sown in a mixture of two-thirds loam and one-third sand. As soon as they come up, they should be planted off in small pots in the same kind of soil, as they are very apt to die if left too long in the sand-pot."

AVENA (see p. 177, for Gen. Char.)

1. AVENA SATIVA (see p. 178).

2. AVENA PRÆCOX (early Oat-grass). Eng. bot. t. 1296. *Panicle sub-spiked; florets nearly equal to the glume; beard jointed, longer than the glume; leaves setaceous.*—The general hue of this plant is green, frequently tinged with purple from exposure to much light. The root is fibrous and annual; stems several, two or three inches high, straight, leafy, variegated with green and white. It is scarcely necessary to say that this trifling grass has little to recommend it to the farmer's notice. Common on dry gravelly ground in the spring, flowering in May, and soon after withering away.

3. AVENA FATUA (wild Oat-grass). Eng. bot. t. 2221. *Panicle equal; spikelets three-flowered; florets less than glumes, hairy at base, all bearded; root fibrous.*—The wild Oat-grass is taller than the cultivated Oat; the culm or straw being commonly three, and frequently four feet in height; it is erect, firm, leafy, smooth, with four joints or knots. This is one of our most destructive annual weeds, and is too frequently so prevalent among barley, as almost to choke it. The seed ripens, and falls before harvest, thus filling the ground, in which it will lie several years without vegetating. It cannot easily be extirpated without repeated fallowing, or by laying down the land to grass.

The awns of this species are sometimes used for hygrometers, and the seeds for artificial flies in fishing for trout.

4. AVENA STERILIS (animal, or great bearded Oat-grass). *Panicle one-sided; spikelets five-flowered; florets less than*

glumes, lower bearded and hairy, upper beardless and smooth; root fibrous.—The root is annual; the culms three or four feet high, and the leaves a foot and a half in length. It is sometimes grown as an object of curiosity, on account of its singular hygrometrical properties. After the seeds have fallen off, the strong beard is so sensible of alteration in the atmosphere, as to keep them in an apparently spontaneous motion, when they resemble some grotesque insect crawling on the ground.

Native of Barbary and of the Southern countries of Europe, flowering in July. Introduced 1777.

5. AVENA NUDA (naked Oak-grass). *Panicle equal; spikelets three-flowered, longer than glumes; florets naked at base; root fibrous.*—The *A. nuda*, the naked, or hill-oat, or peel corn, when ripe, drops the grains from the husks. It was generally cultivated in Worlidge's time in the north of England, Scotland, and Wales, because the kernel threshes clean out of the husk, and need not be carried to the mill to be made into meal or grist. It was made into meal by the lower classes, by drying on the earth, and bruising in a stone mortar, as still practised in the Highlands of Scotland, in Lapland, Ceylon, China, and in every country under certain circumstances of civilization. In the low country of Scotland, the Quern mills, as they were called, now no longer in use, may be seen neglected or dilapidated, by the doors or about the gardens and villages where they were formerly in use.

An acre of ground does not yield so many bushels as of the common oats, by reason the grain is small and naked, and goes near in measure.

6. AVENA PRATENSIS (meadow Oat-grass). Eng. bot. t. 1204. *Root fibrous; leaves rough in tufts, very narrow and complicated; florets longer than glumes; spikelets five-flowered; receptacles simple.*—In this species the stems are few, twelve or eighteen inches high, erect, stiff, with one joint only, which is near the bottom, and clothed in their lower part with the long sheaths of two or three broad short leaves. The flowers grow erect in an upright, mostly unbranched spike, rather than a panicle, but the stalks of the lowermost are generally, one or more of them, lengthened

out in some degree, the rest are very short, or none at all. A native of dry chalky or limestone pastures and heaths, where it flowers in July.

AVENUES are walks of trees leading to a house, which are generally terminated by some distant object.

These were formerly much more in request than at present, there being few old seats in the country but have one or more of these avenues; and some have as many of them as there are views from the house; but of late these are, with good reason, disused; for nothing can be more absurd than to have the sight contracted by two or more lines of trees, which shut out the view of the adjacent grounds, whereby the verdure and natural beauties of the country are lost; and where the avenues are of a considerable length (even where their breadth is proportionable) they appear at each end to be only narrow cuts through a wood, which never can please any person of real taste; and, when the road to the house is through the avenue, nothing can be more disagreeable; for in approaching to the house, it is like going through a narrow lane, where the objects on each side are shut out from the view; and when it is viewed from the house, it at best has only the appearance of a road, which being extended to a length in a straight line, is not near so beautiful as a common road, which is lost by the turnings, so as seldom to be seen at a great extent; but as these avenues must be made exactly straight, so when the trees are grown to any size, they entirely break the view, whatever way the sight is directed through them; and if this is in a park, the lawn of grass through which the avenue is planted, is thereby entirely deprived of the beauty which it naturally would afford, if left open and well kept: therefore, whenever the situation of a house will admit of a large open lawn in front, the road to the house should be carried round at a proper distance; and, if it be carried sometimes through trees, and serpented in an easy natural way, it will be much more beautiful than any stiff formal avenue, how large soever made.

But as there may be some persons so much wedded to the old way of laying out and planting grounds, as to prefer the avenues to the most beautiful disposition of lawns, woods, &c., I

shall mention the usual methods of designing and planting them, that have been esteemed the best.

The usual width allowed to these avenues was generally as much as the whole breadth of the house and wings; but if they are planted twelve or fourteen feet wider, they will be the better; because when the trees are grown to any considerable size, they will spread and overhang, and so will contract the view.

And as for such avenues to woods or prospects, &c. they ought not to be less than sixty feet in breadth; and because such walks are a long time before they are shady, it will be convenient to plant another row on each side, rather than to lose the stateliness that the main walk will afford in time by being broad, where any thing of a prospect is to be gained.

And as to the distance one from another, they should not be planted nearer one another than thirty-five or forty feet, especially if the trees are of a spreading kind; and the same distance, if they are for a regular grove.

As to the trees proper for planting avenues, they may be the English Elm, the Lime-tree, the Horse Chesnut, the common Chesnut, the Beech, and the Abele.

Firstly, the English Elm is approved for all places where it will succeed, and that it will do in most places, except in very wet or cold shallow grounds; and because it will bear cutting, heading, lopping in any manner whatsoever, and probably, with better success than any other tree.

Secondly, the Lime-tree. This is approved by others, because it will do well in any tolerable soil, if the bottom be not hot and gravelly; and because of the regular shape it has in growing, the agreeableness of its shade, and the beautiful colour of its leaves.

Thirdly, the Horse Chesnut is also to be used in such places as are very well defended from strong winds; because, wherever it grows freely, if it be not skilfully managed now and then by cutting, the branches are subject to split down. This tree is valuable on account of its quick growth, the earliness of its coming out, the nobleness of its leaves, and the beauty of its flowers, being a fine plant both for shade and ornament. This delights in a strong

hearty soil, but will do well in any tolerable ground, if good care be taken in the planting of it; but wherever these trees are planted in avenues, they should be placed thirty feet asunder, that their heads may have room to spread, otherwise they will not appear so beautiful.

Fourthly, the common Chesnut will do well in a proper soil, and will rise to a considerable height, if planted close together; but if it be planted singly, where the tree can take its own natural shape, it is rather inclined to spread and grow globous than tall.

Fifthly, the Beech is recommended by some; but this seldom succeeds well after transplanting, without extraordinary care; though it arrives to a very large tree in many places in England, where it grows naturally, and is the most tedious and troublesome to raise to any tolerable size, in a nursery way.

Sixthly, the Abele: this, indeed, grows more dispersed and loose in its head than any of the former, and consequently is worse for defence; but yet is not to be left out from the number of trees for avenues, because it is the quickest in growth of all the forest trees, and will thrive tolerably well in almost any soil, and particularly in wet ground, where few of the before-mentioned trees will thrive; and this seldom fails in transplanting.

Seventhly, the Oak; but this is seldom used in planting avenues, because it requires so long a time to raise it up to any tolerable stature in the nursery way; nor is it apt to thrive much after it has been transplanted, if at any bigness.

As for the Alder, Ash, Platanus, and Sycamore, they are but rarely used for planting avenues.

AVERRHOA (so named in honour of Ebu Elvelid Ebu Rushad, commonly called Averrhoes, of Corduba, in Spain, a famous commentator on Aristotle and Avicenna. He also published Colliget, or the plants used in food, &c. He died at the beginning of the thirteenth century).

Class Decandria Pentagynia. Nat. Ord. Oxalidæ.

The Characters are—*Sepals five; petals five, spreading upwards; stamens inserted in a nectariferous ring; every other one shorter; apple five-cornered, five-celled.*

1. AVERRHOA BILIMBI (*Bilimbi-tree* Averrhoa). *Leaves pinnated; leaflets ovate lanceolate; fruit oblong, with obtuse angles.* Burman describes it as a beautiful tree, with oblong green fleshy fruit filled with a grateful acid juice; the substance and seeds not unlike those of Cucumber; it grows from top to bottom, at all the knots and branches. A syrup is made of the juice, and a conserve of the flowers, which are esteemed excellent in fevers and bilious disorders. Native of Goa, and many other parts of the East Indies, where the tree is called Bilimbi.

2. AVERRHOA CARAMBOLA (*Carambola tree* Averrhoa). *Leaflets ovate, unequal, acuminate; fruit oblong, acute-angled.*—Rheede relates, that the *Carambola* is a tree twelve or fourteen feet in height, scarcely a foot in girth, with a rough brown bark: that it bears fruit three times a-year, from the age of three to fifty: that the root, leaves, and fruits, are used medicinally, either alone, or with Areca or Betel leaves; that the latter, when ripe, are esteemed delicious; unripe are pickled; and that they are also used in dying and for other economical purposes.

Burman says, that the acid juice of this is not so pleasant as that of *A. Bilimbi*; that the fruit is rather larger, and is used for the same purposes: and that it is a very beautiful tree.

In Bengal they call it Camruc or Camrunga: in Malabar Tamara-tonga; the Brahmins and Portuguese call it Carambola; and the Dutch Vyfhoecken. Dr. Bruce gives a curious detailed account of the sensitive quality of the petioles and even branches of this tree.

Both the species were introduced into the royal botanic garden at Kew, in 1794.

CULTURE.—These are trees, natives only of India, and other warm parts of Asia—singular for the fruit growing on the trunk itself below the leaves. The flower resembles that of *Geranium*, but the fruit is totally different. They will thrive well in a light sandy loam, and ripe cuttings will strike root freely in sand under a hand-glass in heat.

AVICENNIA (in honour of the famous oriental physician Abu Ali Al Hoesian, Ebn Abdallah Ebn Sina, commonly Avicenna; born at Bokkara in 981. He lived at Ispahan, and died about

1061; or according to others in 1066).

Lin. gen. n. 1237. Reich. 855. Schreb. 1063. Jacq. amer. 178. t. 112. Russ. 108.

Class 14. 2. Didynamia Angiosperma. Nat. Ord. Myoporinae.

The Characters are—*Calyx five-parted; corolla two-lipped, the upper lip square; capsule coriaceous, rhomboid, one-seeded; seed germinating within the capsule.*

AVICENNIA TOMENTOSA (downy-leaved Avicennia). Fl. d'Owart, 47. *Leaves oblong, blunt, downy beneath.*—This tree agrees mostly with the Mangrove, rising not above fifteen or sixteen feet high; its trunk is not so large, having a smooth, whitish green bark; and from the stem are twigs propagating the tree, like that: the branches at top are jointed towards their ends here and there, where the leaves come out, opposite, on very small petioles, two inches and a half long, one inch broad in the middle, smooth, soft, having one large rib of a dark green colour: the flowers are many at the top of the branches, white and tetrapetalous.

According to Jacquin, it grows to the height of twenty feet or more, and is of the same habit with the *natida*.

It varies, with acuminate leaves, more or less hoary underneath.

Native of the East and West Indies. Dr. Patrick Browne says, that it is frequent near the sea, both on the north and south side of Jamaica, growing in low moist ground. This is not the *Anacardium orientale* of the shops, as has been supposed.

It grows well in a mixture of loam and peat: ripened cuttings do best under a hand-glass in moist heat, in a pot of sand. Introduced 1793.

AXINÆA (*acine*, a hatchet; form of petals).

Class Deca-Dodecandria Monogynia. Nat. Ord. Melastomaceae.

The Characters are—*Calyx cup-shaped, five-six toothed; petals 5-6; anthers opening by two pores, ending in a simple spur at the base.*

1. AXINÆA PURPUREA (purple flowered Axinæa). Fl. per. t. 513. *Leaves seven-nerved, cordate, crenated, reticulately veined, wrinkled above.*—A native of Peru, six to ten feet in height. In its native country it grows in groves

and makes an elegant appearance especially when in flower.

2. AXINÆA GLANDULOSA (glandular Axinæa). Rni. 2, et. Pav. fl. per. t. 512. *Leaves ovate, five-nerved, denticulated, clothed with yellow tomentum beneath, but flat, and glabrous above.*—This species is also a native of Peru, and a shrub six to ten feet in height. The flowers are white.

CULTURE.—This genus is composed of elegant flowering shrubs; the species grow best in a mixture of peat and sand, and half ripened cuttings root freely if planted in the same kind of soil, with a hand-glass over them in heat.

AXYRIS.

Class Monœcia Triandria. Nat. Ord. Chenopodeae.

The Characters are—*MALE, calyx three-parted; corolla 0; FEMALE, calyx two-leaved; corolla 0; styles 2; seed 1.*

1. AXYRIS AMARANTHOIDES (simple-spiked Axyris). *Leaves ovate; stem erect; spikes simple.*—The leaves are rugged, with stellate hairs; fruit bearing branches naked for a long way at the base; spike very small, subsessile, quite simple, terminating the branches. Gmelin observes, that the calyx of the female flowers is two or three-leaved. It was cultivated in 1758, by Mr. Miller.

2. AXYRIS HYBRIDA (bastard Axyris). *Leaves ovate; stem erect; spikes panicled.*—This much resembles the foregoing sort, from which however it differs in the spike of flowers being on long peduncles, conglomerate, or directed the same way, twisted, with the fruit-bearing branches crowded close to the stem, and the leaves more rough. According to Gmelin, the calyx of the female flowers is three-leaved, and there is one style. Pallas supposes this to be only a variety of the former sort. Introduced 1780.

3. AXYRIS PROSTRATA (trailing Axyris). *Leaves obovate; stem somewhat divided; flowers capitate.*—Stem much branched, six or seven inches high, diffused; leaves petioled; flowers conglomerate at the ends of the branches, with numerous leaflets among them. According to Gmelin, the calyx of the female flowers is three-leaved. Introduced 1798.

All these are hardy annuals, natives of Siberia.

CULTURE.—All the species are hardy annual plants of little beauty; they are natives of Siberia, of the easiest culture, only requiring the seed to be sown in the open ground.

AYENIA (in honour of the Duke d'Ayen, of the house of Noailles. He was a great patron of botany).

Class Pentandria Monogynia. Nat. Ord.

The Characters are—*Calyx five-parted; petals 5, connected at the end into a star, with their claws slender, bent into the form of a crown; glands 5, stamens shaped; nectary cup shaped; capsule depressed, five-furrowed, five-celled, five-valved; valves bifid.*

1. **AYENIA PUSILLA** (small Ayenia). *Leaves cordate, smooth.*—This species has a weak woody stem, dividing into several slender branches, and rising from nine inches to a foot high. At the base of each footstalk, from the side of the branches, come out two, three, or four purple flowers, each on a separate footstalk.

Many of the flowers being abortive, Linnaeus suggests that they may possibly be of different sexes.

Native of Peru, whence the seeds were sent by the younger Jussieu to Paris. Mr. Miller received them (about the year 1756) from Dr. Monier, intendant of the Duc d'Ayen's garden; and the plants flowered and perfected seeds annually in Chelsea garden. The flowers continue in succession on the same plants from July to winter.

2. **AYENIA LEVIGATA** (smooth Ayenia). *Leaves ovate, quite smooth, entire.*

—A rare shrub, two feet in height, with blood coloured flowers. Native of Jamaica in bushy places.

CULTURE.—The species of this genus are of easy culture; they succeed best in a rich loamy soil. Cuttings of the shrubby kinds root freely in sand, under a glass in moist heat.

AZALEA.

Class Pentandria Monogynia. Nat. Ord. *Ericææ*.

The Characters are—*Capsule two-celled, opening at the end; calyx five-parted, equal; corolla campanulate, five-cleft, unequal; stamens inserted into the base of corolla, equal, straight, included; anthers opening lengthwise; style straight.*

AZALEA PROCTUMBENS (trailing Azalea). Eng. bot. t. 865. *Branches spreading, procumbent; leaves opposite, revolute, very smooth.*—The healthy summits of all the Highland mountains of Scotland are clothed with a profusion of this elegant little shrub. The roots are woody, branched, and creeping; running deep into the black moory soil among the fissures of rocks. Stems also much branched, buried in moss, intricate and tufted, taking root occasionally at their base, clothed with numerous very shining evergreen leaves.

The flowers appear early in July; the calyx is purplish, the corolla rose-coloured, antheræ violet. The capsules ripen in August. It is very difficult to keep in gardens, growing naturally on boggy ground upon the mountains.

AZALEA NUDFLORUM (see *Rhododendron*).

B

BABIANA (a name barbarously derived by Mr. J. B. Ker, from the name *babianer*, which the Dutch colonists at the Cape have given to the plant, because its roots are the favourite food of baboons).

Class Triandria Monogynia. Nat. Ord. *Iridææ*.

The Characters are—*Spatha two-valved, the inner valve two-parted; flower tubular with a six-parted limb; stigmas spreading; seeds buried.*

1. **BABIANA RUBRO-CYANEA** (red-blue Babiana). Bot. mag. t. 410. *The leaves elliptic lanceolate, stalked, downy, tube*

filiform, limb much spreading; segments rhomboidal, spotted at the base.—This species is not less distinguished for the singularity than the brilliancy of its colours; the stalk is from six to nine inches high, round, villous, and leafy. The flowers usually grow three or four together. The tube is about half an inch in length, of a dingy purple. The brim is divided into five spreading segments, the upper part of a fine ultramarine blue on the inside, the lower part the richest crimson, dazzling the eye of the beholder.

It is propagated by offsets, planted

in sandy peat; care must be taken when it comes into flower, that it be not too much exposed to the sun, for that will render its beauties of very short duration.

2. *BABIANA VILLOSA* (dark-red Babiana). Bot. mag. t. 583. *Tube filiform, the length of the regular campanulate limb; alternate segments obtuse, with a point.*—In this species the leaves are rather broad, elliptic-lanceolate, strongly plaited. The stalk is oblique and wavy, rather taller than the leaves. Flowers of a deep blood red, without scent. Anthers dark violet, remarkably large and thick. It flowers in May, and was introduced into Kew gardens in 1778.

3. *BABIANA STRICTA* (upright Babiana). *Flowers funnel-shaped, regular; segments scarcely longer than the tube, flat.*—This species differs from *B. plicata* in the greater regularity and uprightness of its corolla, in being slenderer, its leaves and stem much firmer and less villous, flowers smaller, differing in fragrance, which in this plant is weak but pleasant; from *disticha* the difference is sufficiently evident. The segments of the flower are either all blue or pale grey, or alternately white and purplish, each hardly an inch long.

4. *BABIANA SULPHUREA* (pale-flowered Babiana). Bot. mag. t. 1053. *The leaves elliptic oblong, strongly plaited, downy; segments of the flower thrice as long as the tube.*—It is one of the hardiest and surest flowering of all the species; for there are but few that blossom freely. The flowers are large, with a short tube; limb cream colour, with some tints of blue. The bulbs should be planted in sandy peat, about October, and taken into the hot-house, or placed on a hot-bed in January, to encourage a rapid and early growth; by which means they are frequently induced to throw up their flower stems the beginning of April, which otherwise proves abortive. The roots should not be removed from the pots, till the leaves are somewhat decayed.

5. *BABIANA MUCRONATA* (bristle pointed Babiana). *Leaves elliptic-oblong, stalked, plaited, downy; stalk branched; throat of the corolla funnel-shaped, elongated; segments of the limb linear, obovate, three alternate ones awned, three lower reflexed.*—Native of the Cape. The leaves have stalks nearly

of their own length. The sheaths, like the whole herbage, are downy, and as long as the tube of the corolla. Throat rather short, funnel-shaped as well as the limb, whose segments are very deep; linear and elongated at the base, pale yellow in that part, lilac towards the extremity, the central one of the upper lip largest; the two next awned, like the central one of the lower lip.

6. *BABIANA PLICATA* (sweet-scented Babiana). Bot. mag. t. 576. *Segments length of the tube, nearly equal, the alternate ones wavy; the upper convolute at the end.*—One of the most common species at the Cape, near the town, and in various other places, flowering from May to October. The whole plant except the corolla is pubescent and very tender, from six inches to a foot high. The flowers emit a pleasing caryophyllaceous fragrance; they are of a pale lilac, or bluish white, marked with violet at the base of their three lower segments.

7. *BABIANA DISTICHA* (hyacinth-scented Babiana). *Leaves elliptic-oblong, strongly plaited, finely fringed; throat of the corolla funnel-shaped; segments of the limb linear, lanceolate, nearly equal, partly crisped at the edges.*—The flowers are so exceedingly fragrant, that we do not know a plant on this account more desirable. The scent is somewhat like that of the single oriental hyacinth, but much more exquisite. They are of a bluish-white colour, with dark-blue marks and anthers. Is easily increased, but it is not desirable to remove the roots from their pots above once in three or four years, as these require to be of a good age before they flower at all, and are not nearly so liable to rot as many others. Native of the Cape, flowering in June. Introduced 1774.

8. *BABIANA SPATHACEA* (stiff-leaved Babiana). Bot. mag. t. 638. *Tube filiform, twice as long as the regular limb; segments obtuse, alternate, with a point.*—In this species the leaves are plaited, pungent, linear-lanceolate; (those of old plants often naked) their base tapering into long footstalks dilated downwards. Stalks varying in height, from four inches to near three feet. Spike many flowered; spathas much inflated, with beaked points. Limb pale bluish purple, with elliptic-oblong segments, an inch long, the three lowermost

marked with white and violets. Found by Thunberg at the Cape, in Bookland and Hautum, in dry situations, flowering in our winter months; with us they appear in June. Introduced 1801.

9. *BABIANA SAMBUCINA* (elder-scented Babiana). Bot. mag. t. 1019. *Leaves scarcely downy; stalk smooth; tube hardly longer than the downy pointed spathe; throat cylindrical; segments of the limb nearly equal and uniform, keeled.*—About a span high, with large violet-coloured, very sweet scented flowers, each of whose segments, above an inch long, has a darker violet keel or midrib. It flowers in April and May, is propagated by offsets, planted in sandy peat. Introduced 1799.

10. *BABIANA TUBIFLORA* (tube-flowered Babiana). Bot. mag. t. 680. *Tube filiform, clavate, three times as long as the irregular limb; upper segment divaricating.*—The flowers of this species are about four inches or more in length, five, seven, or more in number, with the tube of a violet colour, and the limb a pale dull straw colour on the inside; the three lower segments are stained with a blood-red subhastately triangular mark. Anthers dark coloured; stigmas the colour of the limb, and about the length of the anthers; capsule quite smooth, naked.

Like most bulbs, it has its period of rest; during which, it should be kept without moisture, but whilst growing, requires abundance; flowering about June or July, and producing good seeds. Like the Crocus, the old root perishing, a number of fresh ones are produced, which may (if thought necessary), be kept out of the ground two or three months. It should be treated as a greenhouse plant; is easily propagated both by seed and offsets, planted in light loamy soil. Introduced 1774.

11. *BABIANA RINGENS* (gaping flowered Babiana). *Leaves smooth; flowers ringent.*—Found in low sandy fields, often by the way-side, in many places about the Cape of Good Hope, flowering from July to September. It is not so tall as the *Thunbergii*, nor so much branched, but the flowers are larger and more handsome, remarkably widely ringent, with one stamen far removed from the other two. It increases itself by offsets, sparingly; the soil should be sandy peat about a foot in depth. This singular plant is recorded to have

been cultivated in 1759, by Miller, but has always been considered scarce.

12. *BABIANA THUNBERGII* (many-spiked Babiana). *Leaves villous; flowers ringent.*—The bulb is deep in the ground, the leaves are radical, equitant, acute, with some principal, yellow, and many intermediate green ribs; minutely downy on both sides, with soft prominent hairs. The stalk is radical, taller than the leaves, a foot high, zigzag, densely clothed with fine soft hairs, and divided into about half a dozen, alternate, spiked, many-flowered branches. The flowers of a crimson colour, are two inches long, crowded, erect; they appear with us in April. It is a native of sandy plains near the sea, below *Verlovozen Valley*, at the Cape of Good Hope, flowering in October. Introduced 1774.

Sweet says, "Babiana is a pretty bulbous greenhouse genus; all the known species have plaited leaves, not unlike the leaflets of some of the palms: they thrive best in a mixture of sandy loam and decayed leaves, or peat, if leaf mould be not easily procured; when in a growing state, they require a moderate supply of water; but after they are done flowering they need no more till they are repotted, which should be done in October, when they should be kept in as cold a place as possible, only to be protected from frost, till they have made fresh roots, and nearly filled the pots; then they may be brought forward in a little more heat, and they will flower strong; they are readily increased by offsets from the bulbs, or by seeds."

BACCHARIS.

Class Syngenesia Polygamia Superflua. Nat. Ord. Compositae.

The Characters are—*Receptacle naked; pappus pilose; involucre imbricated, cylindrical; female florets mixed with the hermaphrodite ones.*

BACCHARIS IVICIFOLIA (Peruvian plowman's Spikenard). *Leaves lanceolate, longitudinally toothed, serrate.*—This plant grows to the height of five or six feet, is a native of America, flowering in July and August. It is pretty hardy, and will live abroad in mild winters, if planted in a warm situation; but it is usually kept in the greenhouse, and placed abroad in summer; it requires much water in warm weather. Propagated by cuttings planted in a shady border, during any of the summer

months, or by seeds, which ripen well in this country. Sown on a common border in the spring. Introduced 1696.

2. *BACCHARIS HALIMIFOLIA* (Groundsel-tree). *Leaves obovate, emarginate; uneate forwards*.—An herbaceous kind of shrub, varying from five to eight feet in height, flowering in October. It is a native of North America, will live in the open air, is seldom injured in the cold of our winters, and may be propagated by cuttings, which should be planted in April or May, upon a shady border, and duly watered in dry weather until they have taken root; at Michaelmas, they will be fit to transplant where they are to remain. Introduced 1683.

3. *BACCHARIS DIOSCORIDIS* (Dioscoride's plowman's Spikenards). *Leaves oblong, sessile, toothed, teeth of the base deeper, and stipule-like*.—The stems are shrubby, six feet high, a little hairy, weak, much branching, luxuriant. It is a native of the Levant, and requires the protection of a green-house. Introduced 1822.

4. *BACCHARIS SCOPARIA* (broom plowman's Spikenard). Brown Jam. t. 34. f. 4. *Stem suffructicose; branches almost opposite, angular*.—This is a shrub or small tree, stem the height of a man or more, branched towards the top, even, streaked, wrinkled, with an Ash-coloured bark. The flowers are white. It is a native of Jamaica, and there found only in the coldest parts of the mountains; it resembles our European broom, and is thence called *Mountain Broom* tree; it is the only tree of the same appearance in that country. Requires the protection of a stove or hot-house in winter. Introduced 1822.

BADIERA (named in honour of M. Badier, a French botanist).

Class Monadelphis Decandria. Nat. Ord. *Polygalæ*.

The Characters are—*Sepals 5, nearly equal, deciduous; petals 3, connected at the base, beardless; stamens 8, monadelphous; capsule compressed, obcordate, two-celled; seeds furnished with a large oily arillus*.

1. *BADIERA DIVERSIFOLIA* (variable leaved Badiera). Sloa. I. t. 5. f. 3, 4. *Leaves oval, oblong, acuminate at both ends; racemes short, axillary*.—This shrub grows very plentifully on the red hills of Jamaica; and there it generally rises to the height of seven or eight

feet. It is there called *bastard lignum-vita*, because it tastes not unlike the gum of that wood, and is sometimes used for the same purposes. The flowers are of a greenish-white.

2. *BADIERA DOMINGENSIS* (St. Domingo Badiera). *Leaves oblong-lanceolate, obtuse; racemes axillary, very long, pubescent*.—A shrub, native of the mountains of St. Domingo, where it attains from three to six feet in height. The flowers are of a greenish yellow colour.

3. *BADIERA PENÆ* (Pena's Badiera). *Leaves obtuse, obovate*.—A native of South America, eight feet in height. The flowers are solitary, axillary on peduncles and of a yellowish colour.

CULTURE.—The species of this genus will thrive well in a mixture of sand, peat, and loam. Young cuttings root readily in a pot of sand, with a bell-glass placed over them in heat.

BÆCKEA (in honour of A. Bæck, a Swedish physician).

Class Pent-Dodecandria Monogynia. Nat. Ord. *Myrtacæ*.

The Characters are—*Calyx five-cleft; petals 5; capsule three-four celled, many seeded, inclosed in the calyx*.

1. *BÆCKEA FRUTESCENS* (Chinese shrubby Bæcke). Bot. mag. t. 2802. *Leaves opposite, beardless; teeth of calyx membranous, coloured*.—A small twiggy shrub, two to three feet in height, with brown bark; the younger branches are dotted with glands, as indeed, is the whole plant. The flowers are small and solitary, each upon a stalk about as long as the flower. This is the only species which we are acquainted with that inhabits China. It requires to be kept in the greenhouse, where it produces its delicate and snow-white flowers in the month of December. Introduced 1806.

2. *BÆCKEA VIRGATA* (slender twiggy Bæcke). Bot. mag. t. 2127. *Leaves linear, lanceolate; peduncles axillary, umbelled*.—This is a very neat lively shrub, three feet high; flowering for a long time in the latter part of the summer and autumn. It requires to be kept in the greenhouse in winter, though it is by no means tender; its soil should be peat and loam, and it may be increased with facility by cuttings. Native of New Caledonia. Introduced 1806.

3. *BÆCKEA CAMPHORATA* (camphor scented Bæcke). Bot. mag. t. 2694.

Quite glabrous; leaves loosely imbricated in four rows, obovate, lanceolate, flat, dotted, finely emarginate, on short petioles; flowers axillary, twin or solitary, pedicellate; stamens 15.—A greenhouse plant, a native of New South Wales; about two feet high in our gardens, much branched. The branches are opposite, slender, and covered with a pale brownish bark. The leaves have their whole surface covered with glandular dots, especially on the under side, which yield a fragrant smell; the flowers appear in the month of July; the petals are white and nearly orbicular. Anthers reddish-brown. It requires the same soil and treatment as the N. H. plants in general.

4. *BÆCKEA LINIFOLIA* (flax-leaved Bæckeæ). Linn. t. 8. t. 12. *Leaves linear, long, mucronate; pedicels short, axillary, one-flowered.*—A new Holland shrub, two to three feet high; the flowers are white, and appear from June to August. Introduced 1818.

5. *BÆCKEA DIOSMIFOLIA* (diosma leaved Bæckeæ). Lin. t. 8. t. 13. *Leaves oblong, cuneated, keeled, acute, crowded, imbricate, and are, as well as the calyxes ciliated.*—Native of New Holland; flowering from August to October; the flowers are axillary, solitary, approximate and sessile. It generally grows to the height of two feet, and requires the protection of a greenhouse. Introduced 1824.

6. *BÆCKEA RAMOSISSIMA* (much branched Bæckeæ). *Leaves linear-lanceolate, acute, spreading; margins scabrous.*—A shrub from the blue mountains N. H., where it varies from one to two feet in height; the flowers are solitary, axillary, and pedunculate; they continue from July to September. Introduced 1825.

7. *BÆCKEA GRACILIS* (slender Bæckeæ). *Leaves linear, obtuse, imbricated in four rows; stem branched, erect.*—A slender shrubby plant; one to two feet in height with white capitate, terminal and lateral flowers; they continue from June to September. Native of New Holland, where it inhabits arid rocky situations. Introduced 1826.

8. *BÆCKEA PULCHELLA* (neat Bæckeæ). *Leaves linear, acute, crowded in the axils and on the branchlets.*—This very neat shrub, from one to two feet in height, is a native of the eastern coast of N. Holland. It produces an innumerable

number of flowers; from July to September they are white and make a very pretty appearance, and the plant merits a place in every collection. Introduced 1825.

CULTURE.—These plants are of free growth in sandy loam and peat, and are generally so hardy as to require little more than protection from frost during winter. Young cuttings will root in sand under a bell-glass.

BALANITES.

Class Decandria Monogynia. Nat. Ord. *Zygophyllæ*.

The Characters are—*Calyx five-parted; petals 5; stamens 10; ovary five-celled, five-seeded; drupe one-celled, one-seeded from abortion.*

1. *BALANITES ÆGYPTICA* (Egyptian Balanites). *Leaves alternate, bifoliolate; spines axillary.*—A tree twenty feet high, with small, whitish flowers; the seed is usually mixed with gum Senegal. It is a native of tropical Africa, and is now cultivated in Egypt. Introduced 1822.

2. *BALANITES FEROX* (fierce Balanites). *Leaflets roundish; spines longer.*—Native of St. Domingo, where it attains to the height of twenty feet and upwards. It was most probably first brought there by the Negroes from Africa. Introduced 1823.

CULTURE.—The species of this genus will grow well in a mixture of sand, loam, and peat; ripened cuttings will strike root freely, if planted in a pot of sand, and placed under a hand-glass, in a moderate heat.

BALLOTA (so named on account of its offensive odour).

Class Didynamia Gymnospermia. Nat. Ord. *Labiata*.

The Characters are—*Calyx hypocrateriform, five-toothed, ten-lined; upper lip of corolla bifid, linear, straight.*

BALLOTA FETIDA (strong-scented stinking horehound). Eng. bot. 2. 46. *Leaves cordate, undivided, serrated; calyx acuminate.*—It is a common weed growing on the sides of banks in most parts of England, as also in walks near towns and villages in Scotland; the stem is upright, of a brownish colour, and two feet in height. The flowers are in whorls, upon branched peduncles, and lean on one side of the stalk; they are commonly of a dull-red colour, but sometimes white. The whole herb is hairy, and has an uncommonly

pungent disagreeable smell. It was formerly used in hysteric cases, but is now fallen into disuse. The Swedes reckon it an almost universal remedy in the diseases of their cattle. Horses, cows, sheep, and goats refuse to eat it. It is seldom admitted into gardens, but may be increased without difficulty by seeds.

BALSAMINA (from balsamum).

Class Pentandria Pentagynia. Nat. Ord. *Balsamineæ*.

The Characters are—*Anthers 5, two-celled; stigma 5, distinct; valves of capsule bending inwards, elastically at the apex; peduncles 1-flowered.*

1. **BALSAMINA HORTENSIS** (garden Balsam). *The leaves lanceolate; the upper alternate; spur shorter than flower.*—Garden Balsamine or Balsam, is an annual plant, rising a foot and a half high, and dividing into many succulent branches. Leaves long, serrate. The flowers come out from the joints of the stem, upon slender peduncles about an inch long, each sustaining a single flower; but there are two, three or four of these peduncles arising from the same joint.

In its wild state, it is about two feet high, with an upright, round, hispid, juicy, white stem, and ascending branches.

By culture this plant is very much enlarged, and becomes very branching. I have seen the stem seven inches in circuit, and all the parts large in proportion, branched from top to bottom, loaded with its party-coloured flowers, and thus forming a most beautiful bush. The varieties which cultivation has produced in this elegant flower are numerous. White, purple, red, striped and variegated of these different colours, single and double of each. Mr. Miller speaks particularly of two varieties, which perhaps may belong to some of the other species. *First*—the immortal Eagle, a most beautiful plant from the East Indies. The flowers double, much larger than those of the common sort, scarlet and white, or purple and white; and there being many of these, the plant is very valuable. *Secondly*—the Cockspur from the West Indies; which has single flowers, as large as the other, but never more than half double, but only with red and white stripes. This is apt to grow to a very large size before it flowers, which is very late in autumn, so that in bad seasons there

will be scarcely any flowers, and the seeds seldom ripen.

Native of the East Indies, China, Cochinchina, and Japan; the Japanese use the juice prepared with alum, for dyeing their nails red. It was cultivated by Gerard in 1596.

Those who are curious to preserve these plants in perfection, pull off all the single and plain coloured flowers from the plants which they preserve for seeds, leaving only those flowers which are double and of good colours; where this is carefully done, they may be continued without the least degeneracy constantly.

The Balsam is one of the most beautiful of popular annuals, forming a showy cone of finely variegated carnation-like flowers. The prevailing colour of the petals are red and white, the former extending to every shade of orange, purple, scarlet, lilac, pink, and especially carnation or flesh-colour. Those are esteemed the most beautiful varieties which have the flowers double, and striped in the manner of a flake or bizarre carnation.

The way to procure very large plants is to sow early in March, to commence transplanting into three-inch pots as soon as the plants have two proper leaves, and to shift every week or ten days into pots a size larger every time, till at last they are in pots of the largest or of a very large size, and in the richest light mould. The plants should be kept all the time in a hot-bed or pit, plunged, and with abundance of room and air, and the heat of the Melon or Pine.

Fairweather, in a communication to the Horticultural Society, observes "that by transplanting only three or four times from No. 48 pots to those of eight inches diameter, he produced Balsams four feet high, and fifteen feet in circumference, with strong thick stems, furnished with side branches from bottom to top, and these covered with large double flowers.

2. **BALSAMINA COCCINEA** (glandular-leaved, or scarlet flowered Balsam). Bot. mag. t. 1256. *The leaves oblong, oval, alternate, serrated; leafstalks with many glands; spur incurved, as long as flower.*—The stems are erect, somewhat branched, from one to two feet in height. The flowers are large and shewy, of a crimson colour, variegated with white and dark stripes;

hey are produced from June to September. It is a tender annual requiring the same treatment as the common garden balsam. Native of the East Indies. Introduced 1808.

3. *BALSAMINA CORNUTA* (horned Balsam). Burm. t. 16. f. 1. *The leaves lanceolate, serrated; spur much longer than the flower.*—This is an annual plant. Stem a foot high, roundish, diffused. Leaves hispid, petioled, large, dusky-green, sweet-smelling. Flowers purple or white. Peduncles few, long. Spur three times as long as the petals, somewhat bowed. Capsule ovate, acuminate, hispid.

In its leafing this resembles the next species, but the flowers are much smaller, with spurs five times longer, and on very long peduncles. In Burman's figure, the peduncles are some solitary, others two, and others three together. The engraver, by mistake, has placed some of them below the leaf. The Ceylonese call it Kudaelu-kola, from Kudaelu a swallow, and Kola a leaf.

Native not only of Ceylon, but of Cochinchina, where the inhabitants use a decoction of the leaves as a wash to their head and hair, to which this plant, which is a common weed in their gardens, gives a very sweet odour.

4. *BALSAMINA MYSORENSIS* (Mysore Balsam). *The leaves oblong lanceolate, remotely toothed; spur straight, shorter than the flower.*—In this species the stem is simple, filiform, varying from six to twelve inches in length. The flowers are small, of a red colour, and appear from July to September. Native of Mysore. Introduced 1820.

5. *BALSAMINA OPPOSITIFOLIA* (opposite-leaved Balsam). *The leaves lanceolate, serrated; spur shorter than the flower.*—This is an upright annual plant, with a succulent jointed stem, a foot in height. Leaves sessile, smooth. Branches single from each alternate axil. Peduncles filiform, naked, commonly three from each axil, longer than the internodes. Flowers small, of a purplish blue colour, with a nectary much shorter than the petals. Native of the island of Ceylon.

6. *BALSAMINA FASCICULATA* (fascicled-flowered Balsam). Rheed. t. 47. *The leaves lanceolate; pedicels aggregate, shorter than the leaves.*—Native of Malabar, from one to two feet in height,

with pale red flowers, and an awl-shaped green spur. Introduced 1823.

7. *BALSAMINA LATIFOLIA* (broad-leaved Balsam). Rheed. t. 48. *The leaves ovate, crenated, rather pilose; spur longer than the flower.* An annual plant, from one to two feet high. Leaves with a prominent dagger point from each notch. Peduncles nearly the length of the leaves. Flowers the same size as in the common Balsam. They appear from July to September. The spur is awl-shaped, almost the length of the peduncle. Native of the East Indies. Introduced 1818.

8. *BALSAMINA ROSMARINIFOLIA* (Rosemary-leaved Balsam). *The leaves linear; spur short, rather recurved at the end.*—Leaves glaucous underneath. Peduncles alternate. Stem a foot high. Flowers small and of a purple colour. Nectary larger than the petals. In other circumstances it agrees with *B. oppositifolia*, from which, however, it appears to be different. Koenig sent it from Ceylon.

9. *BALSAMINA MUTILA* (mutilated-spurred Balsam). *Leaves lanceolate, serrated; spur cucullate, blunt, mutilated.*—Stem annual, a foot high, upright, jointed, red, almost without branches. Leaves blunt, small, smooth, thick sessile. Peduncles long, sub-solitary. Nectary large, compressed, rolled into a spiral. The flowers are scarlet, very handsome, but not sweet. Capsule fleshy. Cultivated in China.

10. *BALSAMINA CHINENSIS* (Chinese Balsam). *The leaves ovate; spur greatly arched.*—This is an annual plant, one foot high, upright, round, alternately branched, red. Leaves sessile, smooth, subserrate, or serrate-tooth-letted. Peduncles longer than the leaf, generally solitary. Flowers of a red-purple. They appear from July to September. Spur of the nectary awl-shaped, thick, very much bowed. Native of China. Introduced 1824.

CULTURE.—Balsams are all showy, flowering plants, and are worth cultivating for the sake of decorating green-houses, when the green-house plants are set out in the open air. Those grown in pots require to be often refreshed with water.

The seeds of these plants should be sown on a moderate hot-bed frame in spring, and when the plants are about two or three inches high, they should

planted into separate small pots, giving care to shade them until they have taken fresh root, replacing them in the hot-bed, after which they should have a moderate share of free air admitted to them when the weather is favourable, to prevent their being drawn tall and weak; they should then be lifted from size to size of pots, until the plants have grown the size required, and when in flower, they may be placed in the greenhouse, where they will make a very showy appearance, and seed easily. Some may be planted out, when young, in the open border, in a sheltered situation, where they will flower, if the summer proves favourable.

A mixture of loam and rotten dung is the best soil for them.

The hardy species may be sown in the open ground.

BALSAMITA.

Class Sygenesia Polygamia Aqualis. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle naked; pappus 0; involucre imbricated.*

1. *BALSAMITA VIRGATA* (twiggy Costmary). *Stem herbaceous, branched at base; branches one-flowered; leaves sessile, lanceolate, serrated.*—A perennial evergreen. The stem is simple, erect, eighteen inches high, angular, purplish; upper branches elongated, one-flowered, lower barren, leafy. The flowers are solitary, terminating, and of a deep yellow colour; they appear in July and August. Native of Italy. Introduced 1791. Increased by cuttings in any of the summer months. Requires the protection of a greenhouse.

2. *BALSAMITA AGERATIFOLIA* (Agatum-leaved Costmary). *Leaves obovate, serrated, sessile, clustered; flowers subcorymbose.*—A procumbent evergreen undershrub, with small flowers of a deep yellow colour. It is a native of Candia, of the Cape of Good Hope, and will not live in the open air in England during the winter. Is propagated by cuttings, which take root very readily during any of the summer months; they require free air in mild weather, and gentle waterings in winter. Introduced before 1605, by Parkinson.

3. *BALSAMITA ANNUA* (annual Costmary). *Radical leaves bipinnate; cauline many pinnated, downy; pinnae linear acute, mucronate.*—This is an annual plant, rising about two feet high. The stem is stiff, but herbaceous, send-

ing out many side-branches their whole length; the lower ones four or five inches long, gradually shorter to the top. The leaves come out in small clusters from the joints. The branches are terminated by clusters of flowers of a bright yellow; each corymb on a short peduncle. They appear in July or August, and continue till the frost destroys them, but the seeds do not ripen in England, by which alone it can be propagated. The whole plant has a fine aromatic smell. Native of Spain and Italy, and was cultivated in 1758 by Mr. Miller.

4. *BALSAMITA VULGARIS* (common Costmary). *Leaves elliptical, toothed, lower stalked; upper sessile auricled at base; flowers corymbose.* The whole plant has a soft pleasant odour. The roots hardy, fleshy and creeping; lower leaves near three inches long, and an inch and a half broad, of a grayish colour. The stems rise from two to three feet high, and send out branches from the side; the leaves on these are like the lower ones, but smaller. The flowers are produced at the top of the stem in a loose corymb; they are naked and of a deep yellow colour, appear in August, but are not succeeded by seeds in England. It is more aromatic, and has a pleasanter smell than common Tansey. It was called *Balsamita* from its balsamic quality; *Costus*, from the Greek—an aromatic shrub; and from its being put into ale, our old English name *Ale-coast*. *Costmary* is the Virgin Mary's *Costus*. It was cultivated here in 1563, as appears from Turner's Herbal.

It is a perennial plant, native of the south of France and Italy, and was formerly pretty much used in the kitchen, and in medicine as a carminative.

Propagated easily by parting the roots in Autumn. Where it is planted for use, the slips should be set in beds at two feet distance every way: in two years the roots will meet; every other year therefore they should be parted and transplanted to keep them within compass. They will thrive in almost any soil or situation, but will continue longest in dry land.

BALSAMODENDRON (from *balsamon*, balsam, and *dendron*, a tree).

Class Diœcia Octandria. Nat. Ord. *Burseraceæ*.

The Characters are—*Flowers un-*

sexual; calyx four-toothed; petals 4, induplicately valvate in æstivation; stamens 8, inserted under the annular disk, with elevated warts between them; ovary 1; style 1, short, obtuse; berry ovate, acute, one-two celled, one-seeded.

1. **BALSAMODENDRON GILEADENSE** (Balsam of Gilead). *Leaves palmately trifoliate; leaflets blunt, quite entire; pedicels one-flowered, three together, shorter than the petiole.*—The tree which produces the balsam of Gilead has purplish branches, striated a little, and protuberant buds loaded with balsamic resin; but whether it be distinct from the next species, *A. opobalsamum*, may be doubted, for the number of leaflets varies much in the first species, as it does also in Alpinus's figure, which Linnæus refers to the *Opobalsamum*, and in that of Mr. Bruce. The true *opobalsamum*, according to Prosper Alpinus, is at first turbid and white, of a very pungent smell, like that of turpentine, but much sweeter and more fragrant, like mint, varying according to its goodness, and of a bitter, acrid, astringent taste: on being kept it becomes thin, limpid, light, of a greenish hue, and then of a gold colour; after which, it grows thick, like turpentine, and loses much of its fragrance. The balsam is in high esteem among the Eastern nations, both as a medicine and as an odoriferous unguent and cosmetic.

2. **BALSAMODENDRON OPOBALSAMUM** (opobalsamum or Balsam of Mecca tree). *Leaves with one or two pairs of acutish, quite entire leaflets; odd one sessile; pedicels one-flowered, shorter than the petioles.*—The *opobalsamum*, balsam of Mecca, and balsam of Gilead are supposed to be the produce of one and the same tree. Gerlach relates that the trees which produce the *opobalsamum* or balsam of Mecca, grow near Bederhunin, a village between Mecca and Medina, in a sandy rocky soil, confined to a small tract, about a mile in length. In the beginning of April, the trees drop their juice from gashes which are made in the smaller branches, into vessels set under them to receive it. A gash does not yield above three or four drops in a day, weighing about a drachm; nor will even the best trees yield more upon the whole in a season than from ten to fifteen drachms. The inhabitants use it as a sudorific, particularly in the rheu-

matism: but it is adulterated upon the spot.

Lady Mary Wortley Montague informs us, that the *balm of Mecca*, of the best quality, is not easy to be got, even at Constantinople: that on applying some of it to her face, it became swelled and red during three days, but that her complexion was much mended by the operation: and that the ladies all use it at Constantinople, and have the loveliest bloom in the world.

Its great scarcity has prevented its coming into use among us: nor are its virtues, probably, superior to those of some of the resinous juices more common in the shops; all these substances being in their general qualities alike, though differing in the degree of their gratefulness, pungency, and warmth.

An inferior sort of balsam is prepared from boiling the young twigs and leaves gently, in a large quantity of water; the balsamic matter rises to the surface, which is skimmed off. After they have thus procured all they can, it is said that they push the fire, and a large quantity of thicker balsam like turpentine rises, which is preserved by itself, and is that principally which we have in Europe. The other can only be obtained by presents; and that which distils naturally from the trees, scarcely supplying the seraglio and great officers, there is none of it sent out of the country.

Hasselquist describes the true *balsam of Mecca* as being yellow and pellucid, with a most fragrant resinous balsamic smell; as being very tenacious, and drawing out into long threads: that it is taken to three grains to strengthen a weak stomach, and that it is a most excellent remedy for wounds. To know whether it be adulterated, they drop some into a glass of water; if it remains still on the surface, it is of little value; but if it instantly extend itself over the whole surface, and may be taken off the water with a hair, silk, or thread, it is then of the best kind. The drugs used to adulterate this balsam, are oil of Sesamum, Cyprus turpentine, and ostrich fat.

Mr. Bruce has given two figures of the balsam tree; one of the whole tree, the other a single branch with the dissection of the fruit. These he says may be depended on, as being carefully drawn, after an exact examination, &c.

two very fine trees brought from Beder Hunein. One of these was five feet two inches high from where the red root begins, or which was buried in the earth, to where it divides itself first into branches. The trunk at thickest was about five inches diameter, the wood light and open, and incapable of being polished, covered with a smooth bark of bluish white, like a standard cherry-tree in good health, which has not above half that diameter; indeed a part of the bark is a reddish brown; it flattens at top like trees that are exposed to snow, blasts, or sea air, which gives it a stunted appearance. It is remarkable for a penury of leaves. The flowers are like those of the Acacia tree, white and round, only that three hang upon three filaments or stalks, where the Acacia has but one. Two of these flowers fall off and leave a single fruit; the branches that bear this are the shoots of the present year; they are of a reddish colour, and tougher than the old wood; it is these that are cut off and put into little faggots, and sent to Venice for the Theriaca, when bruised or drawn by fire, and formerly these made the *xylobalsamum*.

The great value set upon this drug in the East remounts to very early ages. We know from Scripture, that the Ishmaelites, or Arabian carriers and merchants, trafficking with Indian commodities to Egypt, brought with them balm as part of the cargo.

Strabo alone of all the ancients, has given us a true account of the place of its origin. "Near to this," he says, "is the most happy land of the Sabæans, and they are a very great people. Among these frankincense, myrrh, and cinnamon grow; and in the coast that is about Saba, the balsam also." Among the myrrh trees behind Azab, all along the coast to the straits of Babelmandeb is its native country. It grows to a tree above fourteen feet high, spontaneously and without culture, like the myrrh, the coffee and frankincense tree; they are all equally the wood of the country, and are occasionally cut down and used for fuel. We need not doubt but that it was early transplanted into Arabia, that is, into the south part of Arabia Felix, immediately fronting Azab: the high country of Arabia was too cold for it; being all mountainous, and water wanting there. The first plantation

that succeeded seems to have been at Petra, the ancient metropolis of Arabia, now called Beder or Beder Hunein.

Afterwards, being transplanted into Palestine, it obtained the name of *balsamum judaicum*, and balm of Gilead, and became an article of commerce there.

There were three productions from this tree very much esteemed among the ancients. The first was called *opobalsamum* or juice of the balsam which was of the finest kind, composed of that greenish liquor found in the kernel of the fruit; the next was *carprobalsamum*, made by the expression of the fruit when in maturity; the third was *xylobalsamum*, the worst of all; it was an expression or decoction of the small new twigs of a reddish colour. But the principal quantity of balsam in all times was produced by infusion, as at this day. The wound is made by an axe, when the juice is in its strongest circulation in July, August, and the beginning of September. It is then received into a small earthen bottle, and every day's produce is poured into a larger, which is kept closely corked. The Arabs Harb, a noble family of Beni Koreish, are the proprietors of it, and of Beder, where it grows. It is a station of the Emir Hadje, or pilgrims going to Mecca, half way between that city and Medina.

Some books speak of a white sort, brought by the caravans from Mecca; and others of a balsam of Judea, but these are counterfeits and adulterations. The balsam of Judea was lost long ago, but as late as Galen's time, it was growing in many places of Palestine besides Jericho.

When Sultan Selim conquered Egypt and Arabia in 1516, three pounds was then the tribute ordered to be sent to Constantinople yearly, and this was till lately kept up. The remainder is sold or farmed out to some merchants; who, to increase the quantity, adulterate it with oil of olives and wax, and several other mixtures, consulting only the agreement of colour; formerly, we are told, it was done with art, but nothing is easier detected than this fraud now.

It does not appear that the ancients had ever seen this plant, they describe it so variously; and Prosper Alpinus corroborates the errors of the ancients, by saying it is a kind of vine (*viticoccus*). The figure he has given is a very bad one.

The juice, when first received into the bottle, from the wound, is of a light yellow colour, apparently turbid, in which there is a whitish cast, which I apprehend arises from the globules of air that pervade the whole in its first state of fermentation; it then appears very light upon shaking. As it settles and cools, it turns clear, and loses that milkiness. It then has the colour of honey, and appears more fixed and heavy than at first. After being kept some years, it becomes of a much deeper yellow, and of the colour of gold, but continues perfectly fluid, and loses very little of taste, smell, or weight. The smell at first is violent and strongly pungent, like that of volatile salts. In its pure and fresh state it dissolves easily in water. If dropt on a woollen cloth, it will wash out easily, and leave no stain. It is of an acrid, rough, pungent taste, is used by the Arabs in all complaints of the stomach and bowels, is reckoned a powerful antiseptic, and of use in preventing any infection of the plague. These qualities it enjoys probably in common with balsam of Tolu, Peru, &c. which we have received from America. It is always used and particularly esteemed by the ladies as a cosmetic; as such it has kept up its reputation in the East till this day. The manner of applying it is this: you first go into the tepid bath till the pores are sufficiently opened, you then anoint yourself with a small quantity, and as much as the vessels will absorb; never-fading youth and beauty are said to be the consequences.

3. **BALSAMODENDRON KATAF** (Kataf tree). *Leaves palmately trifoliate; leaflets smooth, serrated at the apex; pedicels bifid; berry globose, umbilicate at the apex.*—A tree fourteen feet in height, from which a red sweet-scented powder is obtained; which the women in Arabia use to wash and cleanse their heads.

4. **BALSAMODENDRON KAFAL** (Kafal tree). *Leaves palmately trifoliate; leaflets serrated at the apex, younger ones villous; berry compressed, with prominent dots at the apex.*—This tree is also a native of Arabia, where it attains to the height of twenty feet. It is there called *kafal*. The balsam it produces is considered to possess very laxative qualities.

CULTURE.—A mixture of loam, sand,

and peat will suit these trees, and ripened cuttings will root in sand, under a hand-glass in heat.

BALTIMORA (so named by Linnaeus in honour of F. Calvert, Lord Baltimore, proprietor of Maryland).

Class *Syngenesia Necessaria*. Nat. Ord. *Compositae*.

The Characters are—*Receptacle paleaceous; pappus 0; involucre cylindrical, many leaved; ray five-flowered.*

BALTIMORA RECTA (upright Baltimore). Sch. t. 261. *Stem winged; heads small, pale yellow.*—This is an annual plant, with a stem two feet high, four-cornered, upright, green, with the sides deeply channelled, and the angles rugged; branches lateral, very short; leaves opposite, petioled, ovate serrated, three-nerved, with very short, silky hairs; panicles terminating, small; the flowers are aggregate, terminating axillary, and of a pale yellow or sulphur colour. The seeds are inversely pyramidal, three-sided, smooth crown.

Native of Maryland near Baltimore. Introduced 1781. It flowers in June and July, and is readily increased by seed, which may be sown in any common garden soil.

BAMBUSA (Latinized from the Indian name *bamboo*).

Class *Hexandria Monogynia*. Nat. Ord. *Gramineae*.

The Characters are—*Scales 3, covering the three-flowered spikelets; glume two-valved; style bifid; seed 1.*

1. **BAMBUSA ARUNDINACEA** (common Bamboo cane). Rox. cor. t. 79. *Panicle branched, divaricating.*—The Bamboo has a woody, hollow, round, straight culm, forty feet high and upwards, simple and shining; the internodes a foot in length and circumference; sheaths thick and hairy, rough, convolute, deciduous; branches alternate, slender, solid, spiny, reclining, springing out from the base to the very top; the lower ones being usually cut off. Panicle of flowers diffused in spikes.

The hollow internodes of the cane are frequently found filled with a limpid liquor, which in India beyond the Ganges is not condensed into the substance called *Tabaxir* or *Tabashour*, as it is, though rarely in Malabar.

The Bamboo cane grows naturally almost every where within the tropical regions. Over a great part of Asia it is very common. In China, Coch-

china, Tunquin, Cambodia, Japan, Ceylon, the peninsula of India, and the islands.

This useful plant has been long since introduced into the West Indies; and is said to flourish likewise in South Carolina. Mr. Miller cultivated it in 1730. He says we have plants more than twenty feet high; and if our stoves were high enough, they would probably rise to twice that height. A strong shoot from the root will grow twenty feet in five or six weeks. Some of the stems are as large as a man's wrist, but in general they are as big as common walking-sticks, and when dried are as fit for that purpose as those which are imported.

There is perhaps scarcely any plant that serves for such a variety of domestic purposes as the Bamboo. In the East Indies great use is made of it in building, and the houses of the meaner people are almost entirely composed of it. Dr. Patrick Browne mentions, that it was yet strong and perfect in some of the houses which had been built by the Spaniards in Jamaica, above a hundred years before. Bridges also are made of it, masts for their boats, boxes, cups, baskets, mats, and a great variety of other utensils and furniture, both domestic and rural. Paper also is made from it, by bruising, and steeping it in water, and thus forming it into a paste. It is the common fence for gardens and fields; and is frequently used as pipes for conveying water. The leaves are generally put round the chests of tea which are sent to Europe from China, as package, fastened together so as to form a kind of mat. The tops of the tender shoots are frequently pickled in the West Indies.

In the cavities, or tubular parts of the Bamboo is found at certain seasons a concrete white substance called *Tabasheer*, or *tabachir*, an article which the Arabian physicians holds in high estimation. It is commonly found in what are called the female or large Bamboos. The Bamboos which contain this concrete are found on shaking to contain a fluid, which, after some time gradually lessens, and then they are opened in order to extract the *Tabasheer*. The nature of this substance is very different from what might have been expected in the product of a vegetable. Its indestructibility by fire, its total resistance to acids, its uniting by fusion

with alkalies in certain proportions into a white opaque mass, into a transparent permanent glass, and its being again separable from these compounds entirely unchanged by acids, &c., seem to afford the strongest reasons for considering it as very nearly identical with common siliceous earth. As to its medical virtues, though the drug be, as before observed, in much esteem with the orientalists, yet they are not such as to cause it to have any regard paid it in the modern practice of physic in Europe.

Yet the virtues of the several parts of the Bamboo are very considerable, according to *Louriero*, who in his *Flora Cochinchinensis* tells us that the leaves, bark, buds, and root, are used. The leaves he says, are cooling, emollient, and resolvent: their decoction is good in fevers, cough, pains of the throat &c.; the thin bark is cooling and agglutinant and a gentle astringent: it is good in feverish heats, hæmorrhages, nausea, and vomitings: the roots and buds are attenuating, and promote urine, and purify the blood, are good in difficulties of urine, wandering pains, obstructions, and in venereal cases; from the fresh roots mixed with tobacco-leaves and betel in equal portions, and infused and macerated for some days in oil, is prepared an ointment of great efficacy in discussing hard and schirrous swellings.

β. The leaves of this variety are much narrower, particularly at their base. It is more rare in Europe, though the most common on the coast of Malabar.

γ. The Turks make their writing pens with this variety. It was observed by *Tournefort* in a valley near Mount *Athos*, and on the banks of the river *Jordan*.

I notice these, because Mr. Miller makes them distinct species. There are doubtless many varieties of the Bamboo in the East Indies; and some, which we look upon as such, may possibly prove, on more accurate examination, to be really distinct. *Louriero*, besides three species, mentions three principal varieties which he had observed.

1st. B. *Maxima*. *The lang nga*. *Arun-darbor maxima*. *Rumph. amb. l. 6. p. 12*. The highest and thickest of all the Bamboos, covered very thick with spines.

2nd. B. *Fax*. *The nua*. *Arun-darbor*

cratium. *Rumph. amb. l. 6. c. 2.* The culm about eighteen feet high, and an inch and half in thickness, very straight, the most hollow of any of the Bamboos, and the internodes remarkably long. They fill them with oil and tow, and thus use them as torches in travelling.

3rd. *B. Tabacaria. Oung thaong. Arundarbor spiculorum. Rumph. amb. l. 6. c. 3.* Culm slender, very straight and regular, somewhat solid, rough, blanch-ed; the internodes very long, hard, tough and scabrous. These are polished, and much used for tobacco-pipes by the natives.

Many other varieties may be seen in Rumphius. Sloane and Brown describe the Bamboo of Jamaica to be only from twelve to fifteen feet in height, and about an inch and half in diameter at the bottom.

2. *BAMBUSA VERTICILLATA* (whorl-flowered Bamboo cane). *Rox. cor. t. 80. Spike terminal, simple, whorled.*—According to Roxburgh this is evidently a distinct species. It grows in drier situations, is not so large, has a much smaller cavity, and is very straight. Its great strength, solidity, and straightness, render it much fitter for a variety of uses than the common sort; and it is particularly employed by the natives to make shafts to their spears. It seldom attains to more than twenty feet in height, and requires to be kept in the stove in a moist loamy soil, and is readily increased by suckers. Introduced 1802.

BANFFYA.

Class Decandria Digynia. Nat. Ord. *Caryophyllæ.*

The Characters are—*Calyx tubular, deeply five-parted; petals 5, not unguiculate; stamens 10; styles 2; capsule one-celled.*

BANFFYA PETRÆA (rock Banffyr). *Leaves linear, obtuse, keeled; bracteas minute.*—A plant six inches to a foot in height, with the stem herbaceous, straight, and tufted; flowers white or red. They appear in June and July, and making a very neat appearance, is well adapted for rock-work. It is a native of Transylvania in the Alps of Dinarica, and may be propagated either by seeds or by cuttings, which will root freely if planted under a hand-glass.

BANARA (the name of a shrub in Guiana).

Class Polyandria Monogynia. Nat. Ord. *Bixineæ kth.*

The Characters are—*Calyx six-parted, permanent; petals 6; stigma capitate; berry very succulent.*

BANARA GUIANENSIS (Guiana Banara). *The leaves oblong, ovate, acute, denticulated somewhat tomentose on the under surface.*—A shrub ten feet in height, native of Cayenne in woods. The flowers, which grow in panicles, are of a bright yellow colour, and appear in May. The berries are black. It will thrive well in a mixture of loam, sand, and peat; ripened cuttings root freely in a pot of sand, placed under a hand-glass in heat.

BANISTERIA (in honour of J. B. Banister, a traveller in Virginia, in the 17th century, and author of a catalogue of Virginian plants).

Class Decandria Trigynia. Nat. Ord. *Malpighiaceæ.*

The Characters are—*Calyx girded by eight or ten glands; petals roundish, unguiculate; stamens 10, awl-shaped, cohering at the base; styles 3, usually expanded into leaves at the apex; carpels indehiscent, one-seeded, nearly distinct, ending in a simple, membranous wing, which is thickened on the upper side.*

1. *BANISTERIA AURICULATA* (eared-leaved Banisteria). *Cav. d. t. 255. Leaves profoundly cordate, somewhat sagittate, smooth, with rounded lobes; petioles glandular at the apex.*—A climbing shrub with orange-coloured flowers. Native of Brazil near Rio Janeiro. Introduced 1818.

2. *BANISTERIA CILIATA* (ciliated-leaved Banisteria). *Cav. dis. t. 254. Leaves cordate, orbicular, smooth, ciliated; petioles biglandular at apex.*—A climbing shrub, with glaucous leaves and large orange coloured flowers. Native of Brazil. Introduced 1796.

3. *BANISTERIA SPLENDENS* (shining-leaved Banisteria). *Sloan. J. t. 162 f. 2. Leaves cordate, kidney-shaped, orbicular, clothed with silky down beneath; petioles each with two glands near the leaf.*—A climbing plant, four to five feet high, with round stalks, covered with a gray smooth bark; flowers yellow. Native of South America and of the West Indian islands. Introduced 1820.

4. *BANISTERIA DICHOTOMA* (forked Banisteria). *Burm. t. 13. Leaves somewhat ovate, acuminate, smooth on both surfaces; petioles each bearing two glands near the leaf.*—A climbing shrub.

ative of South America, with flowers of a golden yellow colour. Introduced 825.

5. *BANISTERIA EMARGINATA* (emarginate leaved Banisteria). Cav. d. t. 49. *Leaves elliptical, cordate at the base, mucronated at the apex and emarginate, downy beneath; petioles short, each bearing two glands near the leaf.*—A climbing shrub, native of Gaudupe, with yellow flowers. Introduced 326.

6. *BANISTERIA SERICEA* (silky leaved Banisteria). Cav. d. t. 258. *Leaves bluish, with a mucrone, younger ones only on both surfaces, adult ones only on the under surface; petioles biglandular in the middle.*—A climbing shrub, native of Brazil. The down on the leaves is of a beautiful shining-golden colour. Introduced 1810.

7. *BANISTERIA TOMENTOSA* (woolly leaved Banisteria). *Leaves ovate, obtuse, with a mucrone, clothed with lanched down beneath; petioles each bearing two glands near the leaf.*—A climbing shrub, native of the Antilles; flowers yellow; they appear from May to August. Introduced 1818.

8. *BANISTERIA TILLOEFOLIA* (Lime-tree leaved Banisteria). Vent. c. t. 50. *Leaves orbicular, acuminate, downy beneath; petioles elongated, each bearing two glands near the leaf.*—Native of Java, with purple flowers. Introduced 320.

9. *BANISTERIA SINEMARIENSIS* (Sincarian Banisteria). Aub. g. t. 185. *Leaves ovate, acuminate, smooth above, and covered with close pressed bristles beneath, which are fixed by their centre, as well as the petioles, which also bears two glands near the leaf.*—A climbing shrub; native of Guiana on the margin of meadows, and of St. Domingo. Flowers yellow. Introduced 1824.

10. *BANISTERIA FERRUGINEA* (rusty leaved Banisteria). Cav. d. t. 248. *Leaves ovate, acuminate, smooth above, and shining; rusty beneath, and are, as well as the petioles, clothed with close pressed hairs; glands situated on the lower part of the leaf.*—A climbing shrub, native of the Brazils. Leaves 60 inches long; flowers yellow; fruit pubescent with erect wings. Introduced 318.

11. *BANISTERIA PERIPLOCEÆFOLIA* (periploca-leaved Banisteria). *Leaves long, mucronated, somewhat cori-*

aceous, smooth on both surfaces; petioles each bearing two glands at the apex.—A climbing shrub, native of Porto-Rico. Flowering from June to August; flowers yellow. Introduced 1818.

12. *BANISTERIA LAURIFOLIA* (laurel-leaved Banisteria). Bot. mag. t. 937. *Leaves ovate-oblong, acute, somewhat coriaceous, smooth; petioles without glands.*—This hath many irregular climbing stalks, which fasten themselves to the neighbouring trees, and rise to a great height; leaves are hairy on their under side, where they have many transverse ribs. The flowers come out thinly from the side of the branches; they are of a pale yellow colour, and are succeeded by large winged seeds, which are double.

13. *BANISTERIA PURPUREA* (purple Banisteria). Cav. d. t. 246. f. 1. *The leaves ovate, obtuse, smooth; racemes axillary and terminal.*—This species hath strong ligneous stalks, covered with an ash-coloured bark, which divide into many branches, clothed with winged leaves, composed of five or six pairs of oval small leaves, nearly of the size of the common Acacia, but are whitish on their under side; from the wings of the leaves are produced slender bunches of flowers, growing in a raceme like those of the Currant-bush, of a purplish colour; these are succeeded by broad winged seeds, growing erect. It was sent me from Campeachy, where it grows naturally. Introduced 1759.

14. *BANISTERIA BRACHIATA* (cross-branched Banisteria). *Leaves sub-ovate; branches brachiate; seeds narrower inwards.*—It sends out many branches, which divide again into others, growing without order, and become very bushy upwards, sending out tendrils by which they fasten themselves to the neighbouring trees, and mount to a great height; these are garnished with oval stiff leaves, ending in a point. The flowers are produced in loose spikes at the ends of the branches, which are first of a gold colour, and fade to a scarlet. These are succeeded by seeds of the same shape with those of the fulgens, but are slender, thin, and for the most part single. Native of the West Indies. Introduced 1759.

15. *BANISTERIA FULGENS* (shining-fruited Banisteria). *Leaves sub-ovate, downy beneath; racemes brachiate; pe-*

duncles umbellæd.—It grows naturally in Jamaica, at Campeachy, and several other parts of America, with slender winding stalks, which rise five or six feet high, and are thinly garnished with smooth leaves; the flowers grow in a round bunch at the extremity of the branches; they are of a brownish yellow colour, and are succeeded by winged seeds. Introduced 1759.

16. *BANISTERIA ACULEATA* (prickly Banisteria). *Leaves pinnate; leaflets oblong, obtuse; flowers spiked; stem branching, prickly.*—This species was sent to Mr. Miller from Tolu in New Spain, where it grows naturally. It hath climbing stalks, which divide into many branches, clothed with long winged leaves, composed of about twenty pair of small, oblong, blunt pinnae, each having a deep furrow on the under side. At the wings of the leaves the stalks are armed with short strong spines, a little crooked. The flowers grow in long loose spikes at the end of the branches, and are succeeded by single seeds as large as those of the greater Maple.

17. *BANISTERIA ANGULOSA* (angular leaved Banisteria). Cav. diss. t. 252. *Leaves sinuate, angular; petioles biglandular at the apex.*—Grows naturally in Jamaica. It hath a woody stalk, which twists itself round the neighbouring trees, and rises to their top. The leaves are as large as those of the Bay-tree, and of the same thickness, growing opposite; the flowers are produced in long branching spikes at the ends of the branches; they are yellow or sulphur-coloured, and are succeeded by two or three winged seeds like those of the greater Maple.

CULTURE.—These plants, being all natives of hot countries, cannot be preserved in England, unless they are kept in a bark-stove. They are propagated by seeds, which must be procured from the countries where they grow naturally. These seeds should be fully ripe when gathered, and put into sand or earth, in which they should be sent to England, otherwise they will lose their vegetative quality; for from a large parcel of these seeds which were sent over in papers, as fresh as they could possibly arrive here, very few plants were raised, and those did not appear till the second year; therefore, when the seeds arrive, they should be imme-

diately sown in pots, and, if it happens in autumn or winter, the pots should be plunged into a hot-bed of tanners bark, where the heat is very moderate, and secured from frost and wet, till spring, when they must be removed to a fresh hot-bed, which will bring up the plants; but if they should not appear the first year, the pots should be preserved till the next spring, to see if the seeds will grow. When the plants come up, they must be put into separate pots, filled with light earth, and plunged into the bark bed, after which they must be treated like other tender plants from the same countries.

BANKSIA (so named by LINNÆUS, in honour of Sir J. Banks, Bart., F. R. S., a distinguished promoter of natural history and of science in general; he died in 1820).

Class Tetrandria Monogynia. Nat. Ord. *Proteaceæ*.

The Characters are—*Calyx four-parted; stamens immersed in the concave ends of the segments; scales 4, hypogenous; ovary two-celled, with one-seeded cells; follicle two celled wood; dissepiment loose, bifid.*

1. *BANKSIA PULCHELLA* (small-flowered Banksia). *Leaves acerose, entire, pointless; tube of the corolla woolly; limb smooth; stigma capitate, depressed.*—Native of dry heaths, near the sea shore, in LEWIN'S land, on the southern coast of N. Holland; flowering from February to August. Intro. 1815.

2. *BANKSIA SPHEROCARPA* (round-fruited Banksia). *Leaves acerose, entire, pointed; corolla hairy all over, externally; stigma urot-shaped; cones globose.*—Also a native of LEWIN'S land, where it is found on low heaths. The leaves are an inch long. The flowers yellow. Increased by cuttings. Introduced 1803.

3. *BANKSIA BRISIFOLIA* (heath-leaved Banksia). Bot. mag. t. 738. *Leaves acerose, emarginate, two-toothed entire; flower-heads long, silky; stigma capitate.*—This species is a native of the eastern coast of New Holland, on rocky heaths near Port Jackson, and was among the first botanical communications from that country. The stem is three or four feet high. Leaves very numerous, the length of the nail, evergreen and smooth. Flowers bright yellow. Catkins five or six inches long. Introduced 1788.

4. *BANKSIA SPINULOSA* (prickly-leaved Banksia). Bot. rep. t. 457. Leaves acerose, three-toothed at end, the middle tooth longest, prickly or entire to the edge; stigma subulate.—The leaves are from one to three inches long, white beneath. The flowers appear from May to December. Corolla yellow. Exposed part of the styles purple. Introduced 1788.

5. *BANKSIA COLLINA* (hill Banksia). Leaves linear, prickly-toothed; the terminal tooth shortest.—Found by Mr. Brown on dry open hills, about Hunter's river, N. S. W. It makes an ornamental appearance, and is about six feet in height. Introduced 1800.

6. *BANKSIA OCCIDENTALIS* (west-coast Banksia). Leaves linear, beyond the middle prickly, toothed beneath, veinless; stem shrubby; branches smooth.—Grows naturally in heathy ground at Lewin's land, N. S. W. It is about four feet in height, and was introduced in 1806.

7. *BANKSIA LITTORALIS* (sea-side Banksia). Leaves long, linear attenuated at base, veinless beneath; stem arborescent; branchlets tomentose.—Native of the sandy shores of creeks in Lewin's land, N. S. W., where it attains to eight feet in height. Introduced 1803.

8. *BANKSIA MARGINATA* (variegated Banksia). Bot. mag. t. 1947. Leaves linear, truncate, mucronate, entire or toothed; veins beneath inconspicuous; ends of branches hairy.—A very handsome greenhouse plant. It grows rather freely, and attains a considerable size. The stem is usually six feet high. The leaves rarely exceed two inches in length; their under side white and downy. The flowers are produced in May, from buds formed the preceding year between the forks of the old wood. They are of an orange colour.

It is propagated, although with difficulty, by cuttings and layers, and flourishes in a mixture of loam and peat earth. Native of heaths in the neighbourhood of Port Jackson. Introduced 1804.

9. *BANKSIA AUSTRALIS* (south coast Banksia). Bot. reg. t. 787. Leaves linear, abrupt, pointed, entire, revolute, reticulated with veins beneath, ultimate branches, downy; scales of the catkin ob-

tuse, nearly equal, downy at the summit, keel of the limb of the corolla very slightly silky; stem arborescent.—This species grows abundantly in the open fields of Van Dieman's Island, as well as by the sea-side. Introduced 1822.

10. *BANKSIA INTEGRIFOLIA* (entire-leaved Banksia). Bot. mag. t. 2770. Leaves whorled, oblong, lanceolate, entire, mucronulate, with conspicuous netted veins beneath; stem arborescent.—This is generally a small, or middle-sized tree with the trunk erect; bark dark and cracked; branches when young covered with soft yellowish pubescence. Buds in whorls, but generally, all excepting one or two, abortive. Leaves green and naked above, below covered with white tomentum. Flowers terminal. Head from two to three inches long, less than half the length of the leaves, which are generally crowded at the base. Mr. Brown says this is a very variable species, and that it is a native of the east coast of N. H. near the sea shore at Port Jackson. Introduced 1788.

11. *BANKSIA INSULANS* (island Banksia). The leaves linear or wedge-shaped, oblong, rounded, mucronulate, scattered or whorled beneath, netted.—Native of the islands of the Boss strait, as well as that of Van Dieman, near the shore. Introduced 1823.

12. *BANKSIA VERTICILLATA* (verticillate Banksia). Hook. ex. fl. t. 98. The leaves whorled, lingulate, oblong, obtuse, unarmed beneath, veinless, white; stem arborescent.—A very ornamental species, twelve feet high. Native of Lewin's land, near the sea-side, and also of the south-west coast of New Holland. The flowers are yellow, and appear from July to October. Introduced 1794.

13. *BANKSIA PALUDOSA* (marsh Banksia). Bot. reg. t. 697. Leaves somewhat whorled, wedge-shaped, oblong, sub-truncate, attenuated at base beyond the middle toothed, serrate.—It is a low spreading plant of slow growth, and produces abundance of flowers when about two feet high; they come out at the ends of the branches, but it being a year or more from the time of the bud appearing till the flowers open, lateral branches are usually grown round the branches. The under sides of the leaves are white, netted all over with numerous veins, disposed in beau-

tiful order. The flowers appear from January till April. It is not very tender; and may be increased with some difficulty by cuttings; the soil should be sandy peat. Native of marshy ground near Port Jackson, New Holland. Introduced 1805.

14. *BANKSIA OBLONGIFOLIA* (oblong-leaved Banksia). Bot. cab. t. 241. *Leaves scattered, narrow, oblong, truncated, toothed, serrated beneath, ribbed and veiny; footstalks and branchlets tomentose.*—It grows from five to fifteen feet in height, or more; having many knotty tubercles on the stem, especially near the root, which is frequently enlarged by them into a kind of irregular woody bulb. The spike of flowers, which is short, is produced between the forks of the branches, and usually from wood four or five years old. It is generally above a year growing before the flowers open. Introduced 1788.

15. *BANKSIA LATIFOLIA* (broad-leaved Banksia). Bot. mag. t. 2406. *Leaves obovate, oblong, prickly, serrate, acute at base, beneath ribbed, reticulated, cinerous.*—The stem is usually three or four feet high. The flowers appear in August. It is a native of boggy situations near Port Jackson, and is also plentiful about the town of Sydney, where it rarely ripens seed. Introduced 1802.

16. *BANKSIA MARCESCENS* (short-leaved Banksia). Bot. rep. t. 258. *The leaves wedge-shaped, flat, truncate beyond the middle, toothed, serrate at the base, acutish.*—The stem varies from four to six feet in height. The leaves scattered, two to three inches long, green above, white beneath. The flowers are purple, in large handsome catkins; inside of the corolla white; perianth or calyx glabrous, greenish yellow. It flowers in the greenhouse in April. Native of the eastern coast of New Holland. Introduced 1788.

17. *BANKSIA SERRATA* (great serrated Banksia). Bot. rep. t. 82. *The leaves broad, linear, elongate, truncated, serrate beneath, reticulated, smoothish at the base, attenuated.*—This is one of the most stately of the genus, rising to the height of thirty feet, with a hard reddish wood. The leaves are nearly a span long; the catkins large, thick, and heavy, with innumerable downy flowers, whose corolla is purplish, and style crimson; cone ten inches long, very heavy; they resemble those of

the stone Pine, but much larger, and the wood harder; the seeds are placed in capsules, which are placed at a considerable distance from each other, at irregular intervals; the spaces filled up with long harsh threads, and apparently abortive seed vessels. Native of the east coast of New Holland, at Port Jackson, in fields near the sea; flowering from July to September. Introduced 1788.

18. *BANKSIA ÆMULA* (deeply-sawed Banksia). Bot. reg. t. 688. *The leaves broad, linear, elongated, truncated deeply, serrate beneath, reticulated, smoothish; stigma bearded, not furrowed.*—Native of the neighbourhood of Port Jackson; where it grows to a shrub of six feet or more. The flower heads are of a yellowish green. They appear from July to September. Introduced 1788.

19. *BANKSIA DENTATA* (toothed Banksia). *The leaves wedge-shaped, oblong, truncate, sinuate, toothed, undulated, acute at base, beneath ribbed, veiny, snowy.*—In this noble species the branches are rusty and somewhat downy; the leaves are from a span to a foot long, on short stalks, their margins remarkably undulated, and bordered with broad, shallow, spinous pointed teeth; catkins six inches long; scales downy, the larger one to each pair of flowers spinous pointed. Native of the tropical part of New Holland. Introduced 1822.

20. *BANKSIA DRYANDROIDES* (dryandra-like Banksia). Swt. fl. aust. t. 56. *The leaves linear, pinnatifid; leaflets equally triangular, sharp-pointed, and ending in a horny mucus; margins recurved; style smooth; stigma capitate.*—A handsome, stout, upright, evergreen shrub; with numerous, spreading branches, thickly clothed with short, close, brown wool, and numerous short stiff hairs intermixed. Leaves of a glossy green on the upper side, underneath ferruginous, on some leaves, on others of a greyish white. Spikes of flowers short, lateral, proceeding from the old shoots, or the main stem, and seated on leafless peduncles that are clothed with short rusty down. It succeeds well in an equal mixture of light turfy loam, peat, and sand. Ripened cuttings taken off at a joint and planted in sand, under a hand-glass, in a cool situation, will strike root readily.

Native of the south coast of New Holland. Introduced 1827.

21. *BANKSIA GRANDIS* (great-flowered Banksia). *The leaves pinnatifid; lobes triangular, ovate, acute, flat beneath, nerved, smoothish; flowers smooth.*—This magnificent shrub thrives well in the greenhouse. The leaves are twelve or fourteen inches long, pinnatifid to the very rib, roughish to the touch on the upper side, paler underneath. Native of the western coast of New Holland. Introduced 1794.

CULTURE.—*Banksia* is an elegant genus, and contains some of the most specious plants that have been discovered in New Holland, or even in the known world. To be grown well they require a soil composed of equal parts of loam, peat, and sand. The pots should be well drained; and the following is the mode recommended by Sweet, who possessed more extensive practical acquaintance with the subject than any cultivator of his time. "Place a piece of potsherd about half way over the hole at the bottom of the pot, then lay another piece against it that it may be hollow, afterwards put some smaller pieces all round them, and some more, broken very small, on the top of these. All plants belonging to the *Proteaceæ* should be drained in the same manner, as the roots are very fond of running amongst the broken potsherds; and there is not so much danger of their being overwatered; care must be taken not to let them flag for want of water, as they seldom recover if allowed to get very dry; they should also be placed in an airy part of the greenhouse when in doors, as nothing is more beneficial to them than a free circulation of air. Cuttings are generally supposed to be difficult to root, but they will root readily if properly managed: let them be well ripened before they are taken off; then cut them off at a joint, and plant them in pots of sand without shortening any of the leaves, except on the part that is planted in the sand, where they should be taken off quite close; the less depth they are planted in the pots the better, if they only stand firm when the sand is well closed round them; then place them under hand-glasses in the propagating house, but not plunge them in heat; the glasses must be frequently

taken off to give them air and dry them, or they are apt to damp off; when they are rooted, the sooner they are potted off in little pots the better, as the sand is liable to canker their roots if left too long in it; when potted off, they should be placed in a close frame, but not on heat, as a bottom heat will destroy their roots, when they must be hardened to the air by degrees. Plants raised in this way have better roots, grow faster, and flower sooner than plants raised from seeds. In raising them from seeds they should be sown in the same kind of soil as the plants are grown in, and placed in the greenhouse; or if it is in summer they will come up sooner if placed out in the open air; they will soon make their appearance, when they should be potted off in small pots, for if left in the seed-pots too long, they are apt to die, and are more difficult to move with safety."

BAPHIA (from *baphe*, a dye).

Class *Decandria* Monogynia. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx calyptriform, ruptured under the keel; vexillum spreading, somewhat roundish; wings linear, length of vexillum; stamens 10, distinct; legume falciform, six-seeded.*

BAPHIA NITIDA (shining-leaved *Baphia*). Bot. cab. t. 367. *The leaves impari-pinnate; leaflets 5, oval-oblong, acuminate, shining.*—This interesting plant is a native of the interior of Africa. The flowers are produced in the months of November and December; they come out in pairs from the joints, generally where the leaves have fallen off. There is no calyx, properly speaking, but a sort of calyptra, which wholly encloses the flower: when arrived at its proper stage of growth, this bursts usually from beneath the keel, and when the flower is open, it assumes an erect position behind the standard, dropping off soon after. The wings are the length of the standard. The legume is sickle-shaped, containing about six roundish, lenticular seeds. The wood is a valuable article of commerce; it is used as a dye, and imported under the name of *Cam-wood*. Increased by layer and cuttings, which thrive in a rich loamy soil, and require constant stove heat. Introduced 1799.

BAPTISIA (from *bapto* to dye; so named from the economical use of some of the species).

Class Decandria Monogynia. Nat. Ord. Leguminosæ.

The Characters are—*Calyx* half four-
five cleft, bilabiate; *petals* nearly equal;
vexillum with reflexed edges; *legume*
ventricose, pedicellate, many seeded.

1. BAPTISIA PERFOLIATA (perfoliate leaved Baptisia). Bot. cab. 1104. *The leaves perfoliate, roundish, quite entire, rather glabrous; flowers axillary, solitary.*—It has been long known in this country, but has always been scarce. The stalks die to the root every year, and are reproduced in the spring; they are about three feet in height. The flowers are yellow, they appear in August, but are seldom succeeded by seeds in this country; by which alone it can be propagated; requires the protection of a greenhouse, and should be potted in sandy peat. Introduced 1793.

2. BAPTISIA AUSTRALIS (common-blue flowered Baptisia). Bot. mag. t. 509. *The leaves ternate, stalked; leaflets cuneate, lanceolate; stipules longer than stalk, lanceolate.*—This is an hardy herbaceous perennial, growing well in a light soil and open situation, and flowering about the beginning of June. The flowers are blue, and the plant is generally from two to three feet in height. It is a native of Carolina, and an old inhabitant of our gardens, having been cultivated by Mr. Miller in 1758.

3. BAPTISIA EXALTATA (upright Baptisia). Swt. br. fl. g. t. 97. *Stem erect, branched; leaves ternate, stalked; leaflets lanceolate, obovate, five times longer than the petioles; stipules lanceolate, acuminate, three times longer than the petioles; racemes elongated, many flowered, twice the length of the branches.*—A stately perennial, the stems when in flower are from three to four feet high; they are erect and branching. The flowers are solitary, scattered, or in pairs, of a dark blue colour. It succeeds well in the open air, in common garden soil; and may be increased by dividing the roots. A native of North America, flowering from June to August. Introduced 1812.

4. BAPTISIA MOLLIS (soft Baptisia). *The leaves stalked, and are as well as the stem and calyxes minutely pubescent; leaflets rhomboid-lanceolate; stipules foliaceous.*—A decumbent plant, native of Upper Carolina, where it occurs abundantly in the open bushy forests.

The stems are purplish. The flowers blue. The leaves are often two inches long and one broad. Flowers in June and July. Introduced 1824.

5. BAPTISIA ALBA (white-flowered Baptisia). Bot. mag. t. 1177. *The leaves ternate, stalked; leaflets elliptical, oblong; stipules deciduous, subulate, shorter than stalk; ovaries smooth.*—The habit of this species, its smoothness, and rather glaucous hue, agree with the Australis, to which it is certainly most nearly allied; but the leaflets are elliptical, the flowers white, more oblong, in consequence of the greater length of the wings and keel, the stipules small and deciduous. Some of the flowers, in both these species, are often whorled, and give the cluster an interrupted form, like that of a *Lupine*, the aspect of which genus is otherwise visible in these plants. It is a hardy herbaceous perennial, readily propagated by seeds, and with care by parting its roots. A variety with blue flowers is sometimes seen. A native of the western parts of Virginia and Carolina, on the banks of rivers, flowering in June and July. Introduced 1724.

6. BAPTISIA TINCTORIA (dyer's Baptisia). Bot. mag. t. 1099. *The leaves ternate, stalked; leaflets roundish, obovate; stipules setaceous, obsolete.*—A low, partly procumbent, smooth plant, whose numerous branches are each terminated by a simple cluster of yellow flowers, which are produced in July and August. It is said to have been cultivated for *Indigo*, in the North American settlements, and even in Barbadoes, before the true *Indigofera* was introduced. With us, it is quite hardy, and grows about two feet high, thriving either in a pot or in the ground. The soil should be loam and peat, and it may be sparingly increased by dividing the roots in the spring. Native in woods on dry hills, from Canada to Carolina. Introduced 1759.

CULTURE.—This genus contains many very handsome species, that are very ornamental in our flower borders and of the easiest culture. They sometimes ripen seeds, by which they are usually raised, and they may also be increased by dividing the plants at the roots.

BARBAECENIA (was so named by Vandel, in honour of Barbaecena, a governor of Minas Gernes, in Brazil).

Class Hexandria Monogynia. Nat. Ord. Hypoxiceæ.

The Characters are—*Perianthium corolliform; ovario adnatum, infundibuliform; sefidum: filamenta bifida, antheras dorsæ affixas in divisione, non semper gerentia; capsula trilocularis, polysperma* (Mart).

BARBACENIA PURPUREA (purple flowered Barbacenia). Bot. mag. t. 2777. *The leaves linear, acuminate, carinate, spinosely serrated; scape longer than the leaves; ovary elongated, tuberculated.*—This species is a native of Brazil, inhabiting mountains of micaceous schist and other primitive rocks, in dry barren places, at an elevation of from one thousand, to five thousand five hundred feet above the level of the sea, and between the fourteenth and twenty-third parallels of south latitude. Its numerous blossoms, of a deep and lively purple, have a very beautiful effect, and makes it a most valuable and highly interesting addition to our stoves. It may be increased by dividing the plant, and also by seeds. Flowers in August and September. Introduced 1825.

BARBAREA (anciently called herb of St. Barbara).

Class Tetradynamia Siliquosa. Nat. Ord. Cruciferae.

The Characters are—*Siliqua tetragonally two-edged; valves without a mucron or horn at the top; calyx equal at the base.*

1. BARBAREA VULGARIS (common Winter cress, or yellow Rocket). Eng. Bot. t. 443. *The lower leaves lyrate, terminal; lobe roundish, upper obovate, toothed.*—The root is perennial and tapering. Stem two or three feet high, erect, strong, and smooth. The leaves are all alternate, of a deep shining green, deeply veined. Flowers terminal, corymbi soon lengthened out into spikes; they are numerous, of a yellow colour, and the calyx is also partly coloured.

The taste of this herb, though ever so young is bitterish, slimy, and very nauseous: yet Linnaeus says, The common people in Sweden use the leaves in salads early in the spring, and late in the autumn: they also boil them as kale. Some also in England cultivate it for spring salad, under the name of *French or American Cress*; but it has to most people a bitter unpleasant taste, with nothing in flavour to recommend it.

It is commonly found on banks of ditches and streams, in watery places; sometimes in cultivated fields and even on walls. It flowers from May to July. It is called *Winter Rocket* as well as *Winter Cress*; and herb *S. Barbara*. In German it is named *die Winterkresse, Barbenkraut, Barbelkraut, Rapunzel, Senkskraut, Sehnodesens, Habichtskraut, gelber Beyfuss, falsche Bunion*. In Danish *Vinterkars*, In Swedish *Vinterkresse*. In French *la Barbaree, l'herbe Sainte Barbe, l'herbe aux charpentiers, la Julienne jaune, Roquette*. In Italian *Barbarea, erba di Santa Barbara, Ruchetta*. In Spanish *Hierba de Santa Barbara, Ruqueta*. In Portuguese *Herva de S. Barbara*.

There is a double flowering variety of this species commonly called *double yellow Rocket* which is certainly a very ornamental plant for flower borders; and may be increased by cuttings.

2. BARBAREA PRÆCOX (early Winter-cress). Eng. bot. t. 1129. *The lower leaves lyrate, terminal; lobe ovate, upper pinnatifid, with linear, oblong, entire lobes.*—The root appears to be perennial. Stem about eighteen inches, in moist situations, two feet, high, erect, leafy, angular, smooth, a little branched, purplish below. Flowers small, pale yellow. It begins to flower in May, and may be found till autumn. Native of France, England, (most common in Devonshire), in watery, grassy places, or on the banks of ditches. It is also found in N. America, on banks of rivers &c.

This plant is called in French *Cresson d'Amerique, or roquette des jardins*. In German, *Americanisher*, and in English, *American-cress, or Block American-cress*. It is generally liked as a Winter-cress and early spring salad, in flavour the common Water-cress, but rather more bitter. In some places it is in demand throughout the year.

It is raised from seeds, and for every 10 feet of drill, a quarter of an ounce will be requisite. Sow in a bed of light dry earth, rather in drills nine inches apart than broad-cast. For winter and spring use, make a sowing in the last fortnight of August or beginning of September, on a warm sheltered border.

If wanted throughout summer, sow every six weeks from March to August, giving a sunny or shaded situation,

according to the advancement of the season. Water occasionally in hot dry weather. At the approach of winter, shelter the plants, by laying a few light twigs among them, so as not to interfere with their growth; and upon these, a covering of fern, reeds, or dry litter.

The plants being cut, or the outside leaves stripped off, shoot again for another gathering.

To save Seed.—Let a few choice plants raised in spring run, and they will ripen seed, before the decline of summer.

3. *BARBAREA IBERICA* (Iberian Winter-cress). *Radical and lower leaves pinnatifid, lyrate; lateral lobes ovate; terminal, one cordate entire.*—A plant nine inches in height, native of Iberia, &c., flowering from May to August. The flowers are yellow; pods straight, pressed to the rachis. Introduced 1826.

4. *BARBAREA TAURICA* (Taurian Winter-cress). *Radical and lower leaves pinnatifidly lyrate; terminal lobe and upper leaves ovate, toothed.*—The root is creeping; the stem a foot and a half long; flowers yellow, pods ascending. The flowers appear from June to September. Native of Tauria, and the Alps of Caucasus. Introduced 1826.

5. *BARBAREA PLANTAGINEA* (Plantain-leaved Winter-cress). *The lower leaves dentately lyrate; lateral lobes tooth-like, terminal one large, somewhat cordate; upper leaves ovate.*—Native of the Levant, resembling *B. vulgaris* but larger in all its parts. The pods are somewhat incurved. Flowers from May to August. Introduced 1823.

CULTURE.—The species of this genus thrive best in a damp or moist situation, in any kind of soil and are easily increased by seeds, or dividing the plants at the roots.

BARBIERIA (In honour of J. B. G. Barbier, M. D., a French physician and naturalist).

Class *Diadelphia Decandria*. Nat. Ord. *Leguminosæ*

The Characters are—*Calyx tubular, five-cleft, bibracteate at the base; wings shorter than the keel, and keel shorter than vexillum; style bearded at the apex; stigma obtuse; legume linear, villous, many-seeded.*

BARBIERIA POLYPHELIA (many-leaved

Barbieria). *The leaves with nine-eleven pairs of elliptic, oblong, mucronate, leaflets.*—A shrub, native of Porto Rico; the racemes are axillary, few-flowered, shorter than the leaves. The flowers are of a scarlet-purplish colour, and make a very pretty appearance, during their continuance in bloom. It grows best in a mixture of loam and peat, and may be increased by seeds, or by cuttings, which root readily under a bell-glass in heat. Introduced 1818.

BARCLAYA (in honour of the late Robert Barclay, of Bury Hill, eminently distinguished for his love of plants).

Class *Polyandria Polygynia*. Nat. Ord. *Nymphiaceæ*.

The Characters are—*Sepals 5, distinct, hypogynous; corolla seated upon the top of the fruit, tubular above coriaceous, bearing the stamens on the inside of the tube, with the throat eighteen lobed.*

BARCLAYA LONGIFOLIA (long leaved Barclaya). Linn. t. vol. 15. t. 18. *The leaves thin, elongated, oblong, rather narrowest at the base; feather nerved, shining, rusty beneath.*—A floating aquatic, native of the East Indies, in Pegu, near Rangoon in stagnant water. It grows in great abundance towards the margin of tanks; it is smooth and slender, not shining: the roots fixed to the bottom; the leaves at first submersed, afterwards floating, and exceedingly thin. The flowers are without any beauty; they are fleshy, smooth, and green, the calyx on the outside purplish green; the raised part within it stained with pink, the rest of a shining sap-green colour without, and deep-red on the inside. The berry separates into two or three pieces along the dissepiments. Each cell is easily separable, consisting of a soft, mealy, fleshy, parenchyma, pinkish-white, the outer margin coated with a thin membrane (which forms the outside of the berry); the inner margin oblique above, and straight underneath; sides with obliquely ascending furrows. The membrane lining the excavation at the top, separates spontaneously, (the styles remaining attached to it), as the tube of the erus; so does also the calyx, remaining attached to the apex of the scape. It flowers in August.

CULTURE.—This singular aquatic plant requires to be always kept in

water in a hot bed or stove; it will seed freely if some pollen be shaken on the stigmas when in bloom, which is the only way of increasing it.

BARILLA, a kind of Spanish alkaline salt used in the glass trade. It is procured by burning to ashes several plants of the kali kind. It is brought over in brown speckled masses, without smell, and strongly alkaline. SEE SODA.

There are four plants which, in the early part of their growth, bear so strong a resemblance to each other, that they would deceive any but the farmer or the critical botanist. These four are barilla, gazul, soza, and salicornia, or salicar. They are all burnt to ashes, but applied to different uses, being possessed of different qualities. Some of the farmers mix more or less of the three last with the first; and it requires a complete knowledge of the colour, taste, and smell of the ashes, to be able to detect their knavery.

Barilla is sown afresh every year. Its greatest height above ground is four inches, each root pushes out a vast number of little stalks, which again are subdivided into smaller sprigs, resembling samphire, and altogether form a large spreading bush. The colour is bright green; as the plant advances towards maturity, this colour gradually changes to a dull green, tinged with red.

Gazul bears the greatest affinity to barilla, both in quality and appearance. The principal difference consists in its growing on a still drier, saltier earth, consequently it is impregnated with a stronger salt. It does not rise above two inches out of the ground, spreading out into little tufts. Its sprigs are much flatter and more pulpy than those of barilla, and are more like samphire. It is sown best once in three, four, or five years, according to the nature of the soil. Soza, when of the same size, has the same appearance as gazul, but in time grows much larger, as its natural soil is a strong salt marsh, where it is found in large tufts of sprigs, treble the size of barilla, and of a bright green colour, which it retains to the last. Salicar has a stalk of a deep green colour, inclining to red, which last becomes by degrees the colour of the whole plant. From the beginning it grows upright, and much resembles a bush of young rosemary. Its natural soil is on the declivities of hills, near the salt marshes,

or on the edges of the small drains or channels cut by the husbandmen, for the purpose of watering the fields; before it has acquired its full growth, it is very like the barilla of those seasons in which the ground has been dunged before sowing. In those years of manuring, barilla, contrary to its usual nature, comes up with a tinge of red, and when burnt, falls far short of its wonted goodness, being bitter, more impregnated with salt than it should be, and raising a blister if applied for a few minutes to the tongue. Barilla contains less salt than the others; when burnt, it runs into a mass resembling a spongy stone, with a faint cast of blue. Gazul, after burning, comes as near barilla in its outward appearance, as it does while growing in its vegetable form; but if broken, the inside is of a deeper and more glossy blue. Soza and salicar are darker, and almost black within, of a heavier consistence, with very little or no sign of sponginess. All these ashes contain a strong alkali, but barilla the best and purest, though not in the greatest quantity. Upon this principle it is fittest for making glass and bleaching linen; the others are used in making soap. Each of them would whiten linen; but all except barilla would burn it. A good crop of barilla impoverishes the land to such a degree that it cannot bear good barilla a second time, being quite exhausted. For this reason, the richer farmers lay manure on the ground, and let it lie fallow for a season, at the end of which it is sown afresh without any danger, as the seeds that have sprung up in the year of rest have carried off all the pernicious effects of the dung. A proper succession of crops is thus secured, by manuring and fallowing the different parts of the farm, each in their turn. The poorer cultivators cannot pursue the same method, for want of capital.

The pot ashes, when imported from Spain, are inferior in goodness to those of the Levant, called *pulverine* when loose, small, and in powder, and *rochetta* when in hard rocky lumps. The frit made of these becomes fine and clear crystal glass, especially that from the rocheter or the pulverine in lumps; but the barilla of Spain, though it be usually fatter, yet makes not a glass so white, but usually inclining to a bluish colour. The method in making barilla is the

same as that followed in Britain in burning kelp. The plant as soon as ripe is plucked up, and laid in heaps, and then set on fire. The salt juices run out below into a hole made in the ground, where they run into a nitrified lump, which is left about a fortnight to cool. An acre may give about a ton.

BARK in the anatomy of plants is that exterior coat of trees corresponding to the skin of an animal. As animals are furnished with a *panculus adiposus*, usually replete with fat, which invests and covers all the fleshy parts, and screens them from external cold, so plants are encompassed with a bark replete with fatty juices, by means whereof the cold is kept out, and in winter the spiculae of ice prevented from fixing and freezing the juices in the vessels; whence it is that some sorts of trees remain ever green all the year round, their barks containing more oil than can be spent and exhaled by the sun, &c. The bark has its peculiar diseases, and its insects peculiar to it. It appears from the experiments of Buffon, that trees stripped of their bark the whole length of their stems, die in about three or four years. But it is very remarkable that trees thus stripped in the time of the sap, and suffered to die, afford heavier timber, more uniformly dense, stronger, and fitter for service, than if the trees had been cut down in their healthy state. Something of this nature was observed by Vitruvius and Evelyn. The ancients wrote their books on bark, especially on the bark of ash and lime-tree, not on the exterior, but on the inner and finer bark called *phlyra*, and this custom is yet frequent in the East. Many kinds of bark are used in the arts. Some in agriculture and tanning leather, as the oak bark; some in physic, as the Jesuit's, &c.; others in dyeing, as the bark of alder and walnut trees; others in spicery, as cinnamon, mace, cassia, lignea, &c.; and others for divers uses, as the bark of the cork tree, &c. In the East Indies they prepare the bark of a certain tree, so as to spin it like hemp. After it has been beaten and steeped in water, they extract long threads from it, which are something between silk and common thread; being neither so soft, nor so glossy as silk, nor so hard and rough as hemp. They mix silk with it in

some stuffs, and these are called *mal-lae* and *cherque-millaes*.

The Japanese make paper of the bark of a species of mulberry tree. In the island of Otaheite, the natives make their cloth, which is of three kinds, of the barks of different trees, the paper mulberry above mentioned, the bread fruit tree, and the cocoa tree. That made of the mulberry is the finest and whitest, and worn chiefly by the principal people. Of the bark, too, of a tree which they call *puerou* the *hibiscus* filiceous of Linnæus, they manufacture excellent matting, a coarse sort which serves them to sleep upon, and a finer to wear in wet weather. Of the same bark they also make ropes and lines, from the thickness of an inch to the size of a small packthread.

BARK, JESUIT'S or **BARK**, by way of eminence, quinquina or cinchona. *SEE CINCHONA.*

BARK-BED, in gardening, that sort of hot-bed, which is wholly or principally constituted of tanner's bark, commonly employed in a hot-house, because it retains its heat longer and emits less steam than a hot-bed of horse-dung.

This bed, from its preserving the most uniform and regular degrees of heat, is proved to be the most useful in the propagation and culture of all kinds of tender exotic plants, that are brought from warm climates, and which stand in need of the continued assistance of artificial heat, in this part of the world; beds of this nature, with a little trouble in the management of them, are sometimes found to support a pretty uniform and regular temperature for a considerable length of time. They are generally employed in hot-houses, being formed in pits and cavities constructed for the purpose, frequently the whole length of the house, six or seven feet in width, and three in depth, being enclosed by means of brick-work. *SEE BARK-PIT.*

In these beds the pots of tender exotics are plunged and supported, while they at the same time afford the houses or stoves degrees of heat that may be proper for the growth and support of other plants that do not require to be plunged into the beds.

Bark hot-beds are likewise occasionally formed in pits, constructed for them on the open ground, separately and detached from the hot-house. These are

walled round with bricks, chiefly above the surface of the ground, having a frame or coping of wood upon the top, on which glass lights are fixed, so as to slide with facility.

Beds formed of bark are also employed with success in various sorts of early productions, as early strawberries, melons, peas, French beans, &c.: and by the regular and moderate heat they afford, they generally bring them forward in the greatest perfection. They are likewise made use of in forcing different sorts of curious flowers, of the bulbous, tuberous, and fibrous-rooted kinds, into early bloom—as hyacinths, dwarf-tulips, narcissus, jonquils, anemones, ranunculuses, pinks, &c.; also many flowering plants of the same small shrubby kind, as roses, hypericums, &c. Bark beds are also employed with great advantage, in forcing frames for the purpose of producing early fruit of the apricot, peach, and grape kinds. See FORCING-FRAMES and HOT-WALLS.

Hot-beds constituted of bark, from the slow and regular manner in which the heat is in common evolved, are not so liable as those formed of dung, to injure the plants by their steam; they are therefore to be preferred for all the more important purposes of forcing, where the material can be obtained.

The heat of them may be perpetuated for a great length of time, by having recourse occasionally to the practice of forking or turning them over, adding in such operations about a third part of tan or new bark. The beds must however be almost entirely renewed every autumn and spring.

BARK-BOUND, a disease in trees thought to be capable of being cured by making a slit or opening through the bark.

BARK-PIT, a cavity or pit of a long, square, or other form, a yard or more in depth, appertaining to a hot-house, or stove, &c., and being formed internally, or detached externally, in which to make tan or bark hot-beds, commonly called bark-beds. The dimensions are four, five, or six feet or more in width, having length in proportion to that of the hot-house, &c., and when in detached pits, such as may be required. In both methods they are formed by a low surrounding brick wall about a yard in height in the internal pits, and in the external ones, three or four feet in front,

by four or five in the back wall. These different sorts of pits are indispensably necessary for the constitution of bark beds, as the short loose nature of the tan will not admit of being formed into compact regular beds, without the aid of such kinds of enclosed pits to confine it close together, within the limits that are requisite in the formation of the beds.

Bark pits are necessary for various purposes, in all hot-houses or stoves, and occasionally in forcing houses, &c. Detached bark pits distinct from the hot-house are also very useful in all extensive gardens, on many occasions, being of great service in the culture of many sorts of tender exotics, and in raising various kinds under different methods of propagation, as well as for raising and nursing those of similar kinds in their young and tender growth, also for occasionally forcing and raising early productions of several sorts of hardy plants in the greatest perfection. Hot-houses, or stoves of the common width, have in general only one pit, extending lengthwise; but if they are of considerable extent in length, the pit is sometimes divided in the middle by an intervening passage, to render it more perfect in performing the necessary culture of the plants. Some hot-houses however of very great width, have two internal bark pits ranging parallel lengthwise, with an alley or passage extending between them, which renders them more commodious in giving the requisite culture to the plants that are plunged in the beds, than if the whole was in one extremely wide pit, in which it would often be very inconvenient to come at the plants placed towards the middle of them; so that two parallel pits, each four or five feet wide, become more eligible than one of eight or ten feet, and by having an intervening passage, give a larger scope, and afford a better current of air for the growth of the plants in the beds, as well as admit of reviewing them to greater advantage and effect.

Detached bark pits should be always erected in warm dry situations, in a southerly aspect, and ranged lengthwise, in the direction of east and west, or nearly so, in order to have the whole front incline fully to the same sun, in a sloping manner, on which to place the glasses in the same position, being

generally stationed either contiguous to the hot-house or stove, or they may be erected at one or both ends, extending in a line with it, but separated by a passage between them.

Detached bark pits have sometimes ridged tops, like the roofs of houses, the glasses sloping to both sides, being ranged lengthwise north and south, in order to have the benefit of the sun, and used for the same purposes as the others, though the common south fronting pits, extending east and west, are more generally adopted, being less expensive in glass-work &c., and in general, more convenient for different purposes of the forcing kind.

They should be constructed with walls of brick-work, forming the upright sides and ends nine inches thick; and where fire-flues are extended, the back wall should be of a proper thickness from the bottom, to admit of having flues in the upper parts, a fire-place being contrived externally at the bottom at one end, endwise or in the back part, as may be thought most convenient. Detached pits are formed of wood-work only, by means of post and planking, serving for particular occasions, where no fire heat is required, as flues for that purpose cannot be admitted in such kinds of pits. If additional heat should be occasionally required, hot dung must be applied to the outsides. In these bark-pits, young pine apples are sometimes nursed. They are also used for nursing tender plants in spring and summer, and for forcing early esculent crops, flowers, &c.

The principal detached bark-pits should be formed with brick-work walls, as being both the most effectual for the purposes of heat, and the most durable.

Barking of Trees.—The peeling off the rind or bark. This must be done in our climate in the month of May, because at that time the sap separates the bark from the wood. It would be very difficult to perform it at any other time of the year, unless the season was extremely wet and rainy, for heat and dryness are very great hindrances to it.

BARLERIA.

Class Didynamia Angiosperma
Nat. Ord. Acanthaceæ.

The Characters are—*Calyx four-parted; stamens 2, much smaller than the others; capsule with four angles,*

two-vaired, elastic, without ciars: seeds two.

1. **BARLERIA LONGIFOLIA** (long-leaved Barleria). *Spines of whorls 6; leaves ensiform, very long, rough.*—An ornamental shrub, two feet high. The stem is bluntly quadrangular, erect and hispid. The leaves are opposite, and the flowers in whorls, and axillary. The spines on the stem are three on each side, the length of the whorls. Native of the East Indies, flowering from July to September. Introduced 1781.

2. **BARLERIA PRIONITIS** (thorny Barleria). *Spines axillary, pedate, in fours; leaves quite entire, lanceolate, ovate.*—A showy plant, native of the East Indies; and about three feet in height.

Stem herbaceous, round, stiff. Leaves opposite, running down the petiole, pubescent underneath; between the branch and the leaf a spine with four sharp rays from the same centre. Flowers sessile in the axils, of a bright orange colour. Calyxes acuminate-spiny. Two of the four stamens are very small at the bottom of the corolla, with little anthers. The capsule has a longish solid point. Native of the East Indies, flowering in July and August. Introduced 1757.

The flexible perennial stalks, if cut off during the summer months, and made into lengths of six or eight inches, and planted in pots, plunging them into a hot-bed, and duly watered and shaded from the sun, will soon put out roots, and so may be planted each in a small pot, and plunged into the tan-bed in the stove; for although this sort may be kept in a dry stove through the winter, yet the plants will not grow near so fast, nor will their leaves be so large as those which are plunged into bark. By this method the plants may be propagated in plenty, but as they rarely produce flowers in England, so two or three plants will be sufficient to maintain the species.

3. **BARLERIA BUXIFOLIA** (Box-leaved Barleria). *Spurs axillary, opposite, solitary; leaves roundish, entire.*—This has shrubby stalks, five or six feet high, with strong spines under the leaves. The flowers are white, and produced in whorls towards the upper part of the stalk; they appear in June

and July; these are succeeded by short seed-vessels, containing three or four flat seeds. Native of Jamaica and the East Indies. Introduced 1767.

4. *BARLERIA CRISTATA* (crested Barleria). Bot. mag. t. 1615. *Leaves oblong, entire; two lateral leaves of calyx ciliated wider than the rest, two linear acute.*—It grows with an upright branched stem, between two and three feet high, swelled at the divisions of the branches, rounded, striated, and pubescent. Leaves opposite, on short footstalks, ovate, lanceolate, hispid quite entire, and ribbed underneath by strong transverse veins. Bractes two. Flowers violet colour, the corolla funnel-shaped: tube long, straight; limb five-cleft; lobes nearly equal; germen ovate; style longer than tube; stigma dilated upwards and gaping. A native of the East Indies; flowering from June to October. Propagated by seeds and cuttings. Introduced 1791.

5. *BARLERIA LONGIFLORA* (long-flowered Barleria). *Unarmed; leaves ovate, silky; bractes cordate, scarious; corollas very long.*—This is an under-shrub, with the branches generally opposite, silky, and round. Leaves opposite, petioled, quite entire. Flowers terminating. Bractes two or bivalve, parallel, netted, bluntish, sessile, almost as large as the leaves; and below these four other bractes disposed crosswise, linear the length of the leaves, spreading, silky. Capsule oblong, drawn to a point at each end, four-cornered, the side unequal; it is two-celled, two-valved, opening elastically; dark chesnut-coloured; partition contrary to the valves, bifid, with alternate, hooked supports to the seeds; which are so flattened as to be almost like a bracte, of a brown bay colour, covered with waved bundles of appressed hairs, readily expanding in water into a floccose coma.

Observed on the mountain of St. Thomas, in Malabar by Koenig; flowering from June to September. Introduced 1816.

6. *BARLERIA PURPUREA* (purple Barleria). Bot. cab. t. 344. *Unarmed; leaves lanceolate, solitary, sessile.*—It usually grows about a foot in height, and flowers towards the top of the shoots. The blossoms soon drop off, but are succeeded by others for a considerable time, often two months or

more, generally beginning in September. Towards the end of the year the stems die off, shooting up again in the spring.

Native of Bengal, and requires to be kept in the stove, except during the months of July and August, when it will receive benefit by being placed out of doors in a sheltered place. Propagated by dividing the roots in the spring, and planting them in rich loam.

7. *BARLERIA ALBA* (white-flowered Barleria). Bot. Cab. t. 360. *Leaves ovate, lanceolate, rough; flowers capitate, terminal; bractea ciliate.*—This shrub grows erect, about two or three feet in height, without any thorns. The flowers are white; they appear first on the top of the plant, and afterwards at the end of every side shoot; they soon drop, but are followed by others in quick succession during the most part of summer and autumn. It is readily increased by cuttings, which should be planted in loam. They require to be kept in the stove, except during the very hottest weather. Native of the East Indies. Introduced 1818.

8. *BARLERIA MITIS* (yellow-flowered Barleria). Bot. reg. t. 191. *Unarmed; leaves lanceolate, hairy, entire; flowers tubular, aggregate, terminal; bractes very narrow, setose.*—This is a native of India, introduced about 1816. It is a small upright shrub, and flowers freely in spring and autumn.

CULTURE.—The species of this genus must be protected in the stove; they are easy of cultivation, and may be propagated by cuttings, which should be planted in loam and peat earth.

BARNARDIA (named after E. Barnard Esq., V. L. S., and Vice Secretary of the Horticultural Society).

Class Hexandria Monogynia. Nat. Ord. *Asphodeleae*.

The Characters are—*Perianthium six-parted, patent, equal, persistent; stamina 6, dilated at the base; ovary three-celled, three-seeded; ovules solitary, erect; style subulate; stigma simple.*

BARNARDIA SCILLOIDES (squill-like Barnardia). Bot. reg. t. 1029. *The leaves weak canaliculate, cuspidate; linear; the length of the scape or longer.*—A native of China. The bulb is ovate, tunicated, and about the size of a pigeon's egg. The scape is erect,

six-angled, two feet high. Raceme simple, conical. The flowers are flesh-coloured, green at the back; they appear in September and October. It is increased by offsets, which thrive well in a mixture of loam and peat; and require but little water when not in a growing state. Introduced 1824.

BAROMETER (from *Βάρος*, a weight, and *μετρον*, a measure), is an instrument or machine for measuring the weight of the atmosphere, or the minute variation of the weight or pressure of the incumbent air, in order to determine the changes of weather.

The name *baroscope* signifying an indication of weight, was originally given to the mercurial tube, by Sinclair in Charles the Second's reign; but the more definite one of barometer, became universal a short time afterwards.

This machine is founded on the Torricellian experiment, so called, from the inventor Torricellius, who considering that a column of water of about thirty-three feet, was equal in weight to a column of air of the same base, concluded that a column of mercury, no longer than about twenty-nine inches and a half, would be so too, such a column of mercury being as heavy as thirty-three feet of water. Having selected a tube about a quarter of an inch wide, and four feet long, he sealed one of the ends hermetically, or closed it under the flame of a lamp: he then filled the cavity of the tube with mercury, and applying his finger to the open end; he invested it in a basin likewise containing mercury, though covered with a portion of water. The mercury instantly sunk to nearly thirty inches above the lower surface; but on raising the tube, till its orifice communicated with the layer of water, the mercury ran all out, and the water now sprang up to the top, and occupied the whole of the cavity. It was thus proved that water and mercury are each supported by the same equipoise, which Toricelli, after some hesitation, at last concluded to be the pressure of the external atmosphere. He next converted the mercurial column into a form adapted for observation, by bending the lower end of the tube, and constructed what has since been called the siphon barometer.

It consists of a long tube of glass, hermetically sealed at one end; and

being filled with quicksilver, is inverted so as to have one end of it immersed in a bason of stagnant quicksilver, and the other hermetically sealed, which is exposed to the pressure of the outward air; out of which open end (after such immersion) the quicksilver in the tube being suffered to run as much as it will into the stagnant quicksilver, in which that mouth or open end is immersed, there is wont to remain a cylinder of quicksilver suspended in the tube, about twenty-eight, twenty-nine, or thirty inches high, measuring from the surface of the stagnant quicksilver perpendicularly; but more or less within such limits, according as the weight or pressure of the air incumbent on the external stagnant quicksilver exposed to it, is greater or lesser, leaving the upper part of the tube void, or at least empty of common air.

The *phenomena* of the barometer are various, and the causes assigned for them, by several authors, as various; nor is the use of it in predicting the weather yet perfectly ascertained.

The *greatest height* the mercury has been known to stand at in London, is thirty inches three eighths, and its least, twenty eight inches.

The mean height, upon an average of two observations in every day of the year, kept at the house of the Royal Society, for many years past, is 29.88; the medium temperature, or height of the thermometer, according to the same being 58 deg. But the medium height at the surface of the sea, is 30.04 inches, the heat of the thermometer being 50 deg., and the air 62 deg.

Mr. Boyle observes, the *phenomena* of the barometer are so very precarious, that it is very difficult to form any general rules about the rise and fall thereof, since in that which seems to hold most universally, viz. that when the high winds blow, the mercury is the lower, they sometimes fall, yet the following observations have been made by several authors.

Dr. Halley observes, that in calm weather, when the air is inclined to rain, the mercury is continually low; in serene good settled weather, high.

That on great winds, though unaccompanied with rain, the mercury is lowest of all, with regard to the point of the compass the wind blows on; that, *ceteris paribus*, the greatest

heights of the mercury are on easterly and north-easterly winds; that after great storms of wind, when the mercury has been low, it rises again very fast.

That in calm frosty weather it stands high.

That the more northerly places find greater alterations than the more southern; and that within the tropics, and near them, there is little or no variation of the mercury at all.

Dr. Beal observes, that, *cæteris paribus*, the mercury is higher in cold weather than in warm, and usually higher in morning and evening than at mid-day.

That the mercury is higher in settled and fair weather, than either a little before, or after, or in the rain; and that it generally descends lower after rain, than it was before it; if it chance to rise higher after rain, it is generally followed by a settled serenity.

That there are frequently great changes in the air, without any perceptible alterations in the barometer.

As to the predictions from the barometer, Dr. Halley has found—

That the rising of the mercury forebodes fair weather after foul, and an easterly, or north-easterly wind.

That the falling of the mercury portends southerly or westerly winds, with rains, or stormy winds, or both.

That in a storm the mercury beginning to rise, is a pretty sure sign that it begins to abate.

Mr. Patrick observes, that the falling of the mercury in hot weather presages thunder; that when foul weather happens after the fall of the mercury, it seldom holds long; and the same is observed, if fair weather succeeds presently after its rise.

Hence Mr. Pointer conceives, that the principal cause of the rise and fall of the mercury is from the variable winds which are found in the temperate zones, and whose great inconstancy here in England is most notorious.

A second cause he takes to be, the uncertain exhalation and perspiration of the vapours lodging in the air, whereby it comes to be at one time much more crowded than at another, and consequently heavier; but this latter, in a great measure, depends upon the former.

And from these principles, he en-

deavours to explain the several phenomena of the barometer.

1st. The mercury's being low, inclines it to rain; because the air being light, the vapours are no longer supported thereby, being become specifically heavier than the medium wherein they are floated; so that they descend towards the earth, and in their fall, meeting with other aqueous particles, they incorporate together, and form little drops of rain: but the mercury's being at one time lower than another, is the effect of two contrary winds blowing from the place where the barometer stands, whereby the air of that place is carried both ways from it, and consequently the incumbent cylinder of air is diminished and accordingly the mercury sinks. As for instance, if in the German ocean it should blow a gale of westerly wind, and at the same time an easterly wind in the Irish sea; or if in France it should blow a northerly wind, and in Scotland a southerly, it must be granted, that that part of the atmosphere impendent over England, would thereby be exhausted and attenuated, and the mercury would subside; and the vapours which before floated in those parts of the air, of equal gravity with themselves, would sink to the earth.

2nd. The greater height of the barometer is occasioned by two contrary winds blowing towards the place of observation, whereby the air of other places is brought thither and accumulated; so that the incumbent cylinder of air being increased both in height and weight, the mercury pressed thereby must needs rise and stand high, as long as the winds continue so to blow; and then the air being specifically heavier, the vapours are kept better suspended, so that they have no inclination to precipitate and fall down in drops, which is the reason of the serene good weather which attends the greater heights of the mercury.

3rd. The mercury sinks the lowest of all by the very rapid motion of the air in storms of wind.

For the tract of the region of the earth's surface, wherein these winds range, not extending all round the globe, that stagnant air which is left behind, as likewise that on the sides, cannot come in so fast as to supply the evacuation made by so swift a current; so that the air must necessarily be at-

or less, according to their violence : add to which, that the horizontal motion of the air being so quick as it is, may in all probability, take off some part of the perpendicular pressure thereof; and the great agitation of its particles is the reason why the vapours are dissipated, and do not condense into drops, so as to form rain, otherwise the natural consequences of the air's rarefaction.

4th. The mercury stands the highest upon an easterly or north-easterly wind, because, in the great Atlantic ocean, on this side the thirty-fifth degree of north latitude, the westerly and south-westerly winds are almost always trade; so that whenever the wind here comes up at east and north-east, it is sure to be checked by a contrary gale as soon as it reaches the ocean: wherefore, according to what is made out in the second remark, the air must needs be heaped over this island, and consequently, the mercury must stand high, as often as these winds blow.

5th. In calm frosty weather, the mercury generally stands high because, as he conceives, it seldom freezes but when the winds come out of the northern or north-eastern quarters, or at least, unless those winds blow at no great distance off.

The northern parts of Germany, Denmark, Sweden, Norway, and all that track, from whence north-eastern winds come, are subject to almost continual frost all the winter, and thereby the lower air is very much condensed, and in that state is brought hitherward by those winds; and being accumulated by the opposition of the westerly wind in the ocean, the mercury must needs be pressed to a more ordinary height; and as a concurring cause, the shrinking of the lower parts of the air into lesser room by cold, must needs cause a descent of the upper parts of the atmosphere, to reduce the cavity made by this contraction to an equality.

6th. After great storms of winds, when the mercury has been very low, it generally rises again very fast: he says, he once observed it to rise an inch and a half in less than six hours, after a long continued storm of north-west wind.

The reason is, because the air being very much rarefied by the great evacua-

tion, it rises so much more quickly and swiftly, as to bring it to an equilibrium, as we see water runs the faster for having a greater declivity.

7th. The variations are greater in the more northerly places, as at Stockholm greater than at Paris (compared by Mr. Paschal); because the more northerly parts have usually greater storms of wind than the more southerly, whereby the mercury should sink lower in that extreme; and then the northerly winds bringing the condensed and ponderous air from the neighbourhood of the pole, and that again being checked by a southerly wind, at no great distance, and so heaped up, must of necessity, make the mercury in such case stand higher in the other extreme.

8th. This remark, that there is little or no variation near the equinoctial, does, above all others, confirm the hypothesis of the variable winds being the cause of these variations of the height of the mercury; for in the places above named, there is always an easy gale of wind, blowing nearly upon the same point, viz. E. N. E. at Barbadoes, and E. S. E. at St. Helena; so that there being no contrary currents of the air to exhaust or accumulate it, the atmosphere continues much in the same state.

Mr. Patrick gives the following rules and observations for the rising and falling of the mercury, in order to foreknow the weather by the barometer.

1st. It has been observed, that the motion of the mercury does not exceed three inches in its rising or falling in the barometer of the common form.

2nd. That its least alterations are to be minded, in order to the right finding of the weather by it.

3rd. The rising of the mercury presages in general fair weather, and its falling foul, as rain, snow, high winds, and storms.

4th. In very hot weather, the falling of the mercury foreshows thunder.

5th. In winter, the rising of the mercury presages frost; and in frosty weather, if the mercury falls three or four degrees, there will certainly follow a thaw; but if the mercury rises in a continued frost, it will certainly snow.

6th. When foul weather happens soon after the falling of the mercury, you may expect but little of it; and you

may judge the same, when the weather proves fair shortly after the mercury has risen.

7th. When the mercury rises much and high in foul weather, and continues so for two or three days before the foul weather is over, you may expect a continuance of fair weather to follow.

8th. When the mercury falls much and low in fair weather, and continues so for two or three days before the rain comes, then you may expect a great deal of wet, and probably high winds.

9th. The unsettled motion of the mercury denotes uncertain and changeable weather.

10th. You are not so strictly to mind the words engraven on the plates, though for the most they will agree with them, as the rising and falling of the mercury; for if it stands at much rain, and rises up to changeable, it presages fair weather, although it will not continue so long as it would have done if the mercury were higher, and so on the contrary.

These rules and observations are sufficient to instruct persons who are unacquainted with this instrument, how to make their observations; and with constantly remarking what alterations happen in the weather on the variations of the mercury, a person may nearly predict the great alterations of the weather a day or two before they happen, which is frequently of great use to the gardener and farmer, but particularly to the latter, who may begin to mow his grass when he finds there is a prospect of fair weather, or postpone it a few days until he foresees a likelihood of such. The same also may be of great moment in reaping his corn, as also in sowing his grain, and most of his other business. Therefore the use of this instrument should be generally known by the practical farmer and gardener.

BARRALDEIA.

Class Decandria Monogynia. Nat. Ord. Rutaceæ.

The Characters are *Calyx five-cleft, petals 5, bifid and unguiculate; stamens 10, ovary, adhering to the tube of the calyx; style 1, leaves simple.*

BARRALDEIA MADAGASCARIENSIS (Madagascar Barraldeia). *Calyx urceolar five-cleft, filaments dilated at the base, five of which are opposite the petals, and longer than them, with a glandular circle*

on the outside of the pistil.—A shrub, native of Madagascar, six feet and upwards in height; the branches are opposite and jointed. The leaves, full of pellucid dots, are opposite and very smooth. The flowers, when in the bud, abound with resin; they are small and globular. It is a native of very warm climates, and requires to be kept constantly in the stove in a mixture of loam, sand, and peat. It is increased by cuttings, which should be planted in sand under a hand-glass in heat. Introduced 1829.

BARRINGTONIA (in memory of the Hon. Daines Barrington, F. R. S., an active Fellow of the Society of Antiquarians, and author of several papers in their Transactions).

Class Monadelphia Polyandria. Nat. Ord. Myrtaceæ.

The Characters are—*Limb of calyx, two-three parted; petals 4; stamens numerous, long, ovary four celled; cells two, ovulate; berry large, crowned by the limb of the calyx, one celled at maturity, and one seeded.*

1. **BARRINGTONIA SPECIOSA** (shewy Barringtonia). Sonn. guin. t. 8, 9. *Leaves shining, cuneate-oblong, obtuse, quite entire; fruit acutely tetragonal, pyramidal.*

This is a lofty tree, the handsomest in the whole equinoxial Flora, with its thick, shady bunches of leaves, and its large handsome, purple and white flowers, everywhere mixed with them. The trunk is lofty, thick, straight: covered with a dark grey smooth bark, scored with little chinks. The branches are round, expand very widely, are subflexuose, variously divided, covered with a chinky bark, and leafy at the ends. The leaves are crowded, the upper ones in a kind of whorl, sessile, expanding from a foot to fifteen inches in length, thick, coriaceous, very smooth, shining, dark green, with yellow veins; the rachis yellow, thick, marked with a red base. The flowers are borne on a solitary, erect thyrs, a foot in length, at the ends of the branches. *Peduncle* round, subangular, very smooth, subflexuose, a foot long. *Pedicels* five to twenty, one-flowered, scattered, round, very smooth, expanding, three or four inches long, and the thickness of a goose-quill. *Bractes* roundish, very smooth, quite entire, sessile, deciduous, solitary at the base of the pedicels. *Flowers* very large, very white and

transparent. *Filaments* white, with a purple top, and diaphanous at the base. *Anthers* gold-colour. *Style* white with a purple top. *Drupe* reddish brown.

The flowers open during the night, and fall at sunrise; the birds also pluck them off, and the ground about these trees is perfectly covered with them. The seed mixed with the bait, inebriates fish in the same manner with *Cocculus Indicus*, &c.

It grows within the Tropics, especially on the shores of the ocean, and at the mouths of rivers, in the East Indies, from the southern coasts of China through the Molucca Isles to Otaheite and the other Society Isles, the Friendly Isles, &c. It is cultivated in the governor's garden at the island of St. Helena. Introduced 1786, by Mr. Anthony Hove.

It requires the same treatment as the *B. racemosa*, both with respect to culture and propagation.

2. *BARRINGTONIA RACEMOSA* (Racemose-flowered Barringtonia). Rheed. mal. t. 6. *Racemes pendulous, very long; leaves cuneate-oblong, acuminate, serrulated; fruit bluntly tetragonal, pyramidal*.—A most splendid tree, native of Malabar, Molucas, and the Marianne Islands; growing in humid woods to the height of forty or fifty feet, and adorned with large, shewy foliage and flowers. In this country it is difficult to cultivate, as it requires to be kept moist and warm, and the house in which it is grown should never be allowed to fall below 60 deg. of Fahrenheit. It may be increased by cuttings taken off at a joint, with the leaves on, when the wood is ripe, and planted in sand with a bell-glass over it. Introduced 1823.

BARTHOLINA (named in honour of F. Bartholini, a Danish physician who flourished at the end of the seventeenth century).

Class *Gynandria Monandria*. Nat. Ord. *Orchideae*.

The Characters are—*Flower ringent; inner sepals united below with the lip; lip spurred beneath at the base; stalks of the pollen masses long; cells united to the column; glands distinct, half covered by the exterior lobe*.

BARTHOLINA PECTINATA (pectinated Bartholina). Jour. Sc. v. 4. t. 8. f. 2. Gathered by Thunberg and Sparmann, on the sides of hills at the Cape of Good Hope, in Rooede Sand, as well as Cape Town, flowering from October to De-

cember. The root consists of two or three hairy knobs, the size of a horse-bean. Leaf solitary, radical, orbicular, clasping the flower-stalk, an inch broad, horizontal, fleshy, smooth, and of a fine green on the upper side, paler and veiny beneath, the margin reflexed, and very densely fringed. Flower-stalk solitary, simple, single-flowered, five or six inches high, erect, hairy, with a solitary, funnel-shaped, hairy bractea, half an inch long near the leaf. Flower large, of a very singular aspect. Calyx green, converging, strongly ribbed, and externally hairy, near an inch long, its tube included. Petals whitish, with a blue mid-rib, and a stripe of the same colour in their lower part. Lip two inches in length and breadth, spreading, finely cut, its segments white above, blue underneath, the throat dotted and minutely streaked with blue. Spur greenish white. Masses of pollen (which Linnaeus describes, is a pair of styles) inserted into the base of the style, yellowish, prominent, very conspicuous even in dried specimens.

It requires to be kept in the bark-stove, and may be increased by dividing the roots, and planting them in loam and peat. Introduced 1787.

BARTLINGIA (in honour of C. Bartling, who, with Wendland, wrote an ingenious treatise on Diosma).

Class *Pentandria Monogynia*. Nat. Ord. *Rhamneae*.

The Characters are—*Calyx bibracteate, tubular, five-cleft; petals scale-formed; stamens 10; anthers two-celled, opening laterally; disk wanting; style simple; ovary compressed, one-celled, one-two seeded*.

BARTLINGIA OBOVATA (obovate-leaved Bartlingia). *Leaves alternate, stalked, obovate, thickish, smooth; heads few-flowered*.—A shrub, two feet high; native of New Holland, with white flowers; they appear in May and June. It will succeed well in an equal mixture of loam and peat, with a little sand. Increased without difficulty by cuttings, planted in a pot of sand, with a hand-glass placed over them. Introduced 1825.

BARTONIA (named by Pursh, in honour of Dr. B. S. Barton of Philadelphia; an American botanist).

Class *Icosandria Monogynia*. Nat. Ord. *Loaseae*.

The Characters are—*Calyx five-*

left; petals many; capsule cylindrical, necked at the end, with three-five lid-like valves; placenta 3-5, parietal bearing seeds in a double row.

1. *BARTONIA ORNATA* (naked seeded *Bartonia*). Bot. mag. t. 1487. *Petals 0; ovary leafy; seeds naked.*—This beautiful plant is about three or four feet high, with spreading branches, covered with a profusion of odoriferous flowers, which expand suddenly after sunset, and remain closed up the whole of the day. These flowers are terminal, enveloped in leaves, three inches broad, with about ten elliptical acute white petals, and numerous stamens, an inch and half long; anthers elliptical, yellowish. They rival some of the fine species of *Cactus*. Native of North America: grows spontaneously in the neighbourhood of the banks of the Missouri, from the river Platt to the Andes, on arid volcanic soil, and flowering in July and August. Increased by cuttings, which require to be planted in sandy peat, and have the protection of the greenhouse. Introduced 1811.

2. *BARTONIA NUDA* (winged seed *Bartonia*). *Ovary naked; seeds winged.*—Found by Mr. Nuttall on gravelly hills near the grand detour of the Mississippi, flowering in August. The root is perennial. It has smaller flowers than the *ornata*, and less glaucous leaves. The petals vary in number from ten to fifteen. It requires the same treatment as the *ornata*, and may be propagated in the same manner. Introduced 1811.

BARTSIA (so named by Linnæus, in memory of his beloved friend John Bartsch, M. D., of whom he gives an interesting melancholy account in his *Flora Suecica*).

Class *Didynamia Angiospermia*. Nat. Ord. *Scrophularinæ*.

The Characters are—*Calyx four-lobed, emarginate coloured; corolla smaller than the calyx, the upper lip longest; capsule one celled; seeds angu-*

1. *BARTSIA ODONTITES* (red flowered *Bartsia*). Eng. bot. t. 1045. *Leaves linear, lanceolate, serrated; segments of lower lip of corolla blunt.*—This plant is not uncommon in corn fields, as at *Batavia*, &c.; flowering in July and August. It prefers rather a strong and moist soil, and is most abundant on those

cold clay springy grounds that hold too much water in winter.

Root fibrous, annual. Stem square, oppositely branched, rough with deflexed hairs. Leaves sessile, lanceolate, spreading, serrated, rough, opposite except the floral ones. Clusters terminal, long, leafy. Flowers all leaning one way, sessile. Calyx hairy, purplish, sometimes five-cleft. Corolla of an elegant rose-colour, hairy, its upper lip undivided; lower in three not very unequal lobes. Antheræ large, smooth in front, more or less hairy at the back only, ending at the base in two little points. Style sometimes smooth, often hairy. Capsule a little compressed, hairy. Seeds numerous, small, angular, striated.

With us it appears to be untouched in the pastures, and we are assured by an ingenious observer, that when it is in full vigour, cattle will abstain from the grass, even to the distance of some inches from the plant. It may be increased by seed sown in common garden soil.

2. *BARTSIA ALPINA* (Alpine *Bartsia*). Eng. bot. t. 361. *Leaves ovate, heart shaped, bluntly serrated.*—It prefers a moist stony soil, on the borders of alpine hills, or little boggy spots in the interstices of rocky precipices, flowering after the middle of summer, and soon ripening its seed.

The root is perennial and creeping. Stems from four to eight inches high, erect, simple, square, clothed from top to bottom, with several pair of sessile leaves, acute, veined, smooth above, hairy beneath, the lowermost are very small, the uppermost covered with purple, and out of the bosoms of these the flowers arise solitary, on very short flower stalks forming a terminating leafy spike. The calyx is viscid and hairy, in four nearly equal segments, tipped with purple. Corolla of a violet purple, thrice as long as the calyx, compressed, clothed with glandular viscid hairs, the lower lip reflexed. Antheræ prominent, very hairy. Style projecting beyond the stamina, with a blunt stigma. Capsule ovate, downy, of two valves with a transverse partition arising from each. Seeds numerous, angular, with membranous striated angles.

The whole herb turns very black in

drying, especially when gathered young. It is a very rare plant, and requires great care in its management. It is increased by seed, which should be sown in pots, and kept moist.

3. *BARTSIA VISCOSA* (yellow viscid Bartsia). Eng. bot. t. 1042. *Leaves serrated, the upper ones alternate; flowers lateral and distant; antheræ hairy*.—It is one of our rarest plants, having been found chiefly in marshy parts of Devonshire and Cornwall, and in Argylshire.

Herb downy and viscid, drying black. Root annual. Stem almost always simple, erect, various in height, round, leafy. Leaves sessile, oblong, or somewhat ovate, ribbed, rough, the lowermost opposite, the rest alternate. Flowers axillary, solitary, nearly sessile. Calyx tubular, ribbed, regular, pale or whitish at the base. Corolla yellow, its upper lip undivided, lobes of the lower obtuse, nearly equal, striped at their base. Antheræ hairy, with two sharp lobes. Capsule ovate ribbed, purplish, hairy, especially upwards. Seeds very numerous, minute, somewhat angular, by no means either compressed or winged.

CULTURE.—*Bartsia* is a genus of curious herbaceous plants, of very difficult cultivation. The perennial species may be best propagated by sowing them in a shady bog border; and the annual sorts, which are not quite so difficult to raise as the perennials, may be sown in the open ground. They make a very pretty appearance, and deserve a place in every collection.

BARYXYLUM (from *bary*, heavy, and *xylon*, wood).

Class Decandria Monogynia. Nat. Ord. *Leguminosæ*.

The Characters are—*Sepals 5, hardly connected at the base, equal; petals 5, rather unguiculate; stamens 10, unequal; anthers 4, celled; legume curved, many seeded.*

BARYXYLUM RUFUM (Brown-wooded *Baryxylum*). *Leaflets oblong, obtuse*.—This species is a tree fifty feet high, growing on the Mountains of Cochin China, of which it is a native. The wood is very hard and heavy, of a brownish-red or iron-colour. The leaves are abruptly pinnate, and smooth. The flowers are produced in loose racemes, and of a yellow colour. The seeds roundish, angular.

It may be increased by ripened cuttings, which require to be planted in sand with a bell-glass over them, and when they have taken root, transplanted, where they are to remain, into a mixture of loam and peat.

BASELLA.

Class Pentandria Monogynia. Nat. Ord. *Chenopodææ*.

The Characters are—*Calyx 0; corolla seven-cleft; at length berried with two opposite segments larger than the rest.*

BASELLA RUBRA (Red-flowered Malabar Nightshade). *Leaves flat; peduncles simple*.—This sort has thick, strong, succulent stalks and leaves, of a deep purple colour. The plant requires to be supported, for it will climb to the height of eight or ten feet, when the plants are kept in a stove or glass-case, and produce a great number of side branches: but if they are exposed to the open air, they will not grow so large, nor will they perfect their seeds, except it be in very warm seasons; when they are placed in the bark-stove, they will often live through the winter, and produce great quantities of flowers and seeds. The flowers of this plant have no great beauty, but the plant is preserved for the odd appearance of the stalks and leaves.

The fruit is a sort of spurious berry, of a very dark red colour, flattened a little, furrowed crosswise at top, formed out of the calyx (or corolla) and containing a single nut, of a subglobular form, with five very obscure streaks, and a large umbilical aperture at the base. Medicus affirms that the nut has naturally three cells, with one seed in each.

It is a native of the East Indies, Amboina, Japan, &c. and was cultivated in 1739, by Mr. Miller. In the *hortus malabaricus* it is said, that seed sent from Ceylon grew in the botanic garden at Amsterdam, in 1684.

From the berries of this sort, a beautiful colour is drawn, but when used in painting, does not continue very long, but changes to a pale colour; though I believe this beautiful colour might be fixed, so as to become very useful; for I have been assured, that the juice of these berries has been used for staining calicoes in India.

2. *BASELLA ALBA* (White-flowered Malabar Nightshade). *Leaves oval, wavy; peduncles simple, longer than the leaf*.—This has smaller stalks, the

leaves are oblong and flaccid, and the flowers and fruit are smaller than in the foregoing. Mr. Miller received the seeds from Jussieu, and raised two varieties from them; one with purple stalks and leaves, the other having leaves variegated with white. It was however cultivated by Bishop Compton in 1691. It is a native of China and Amboina.

3. *BASSELLA LUCIDA* (Shining-leaved Malabar Nightshade). *Leaves cordate; peduncles clustered, branched.*—This is a native of the East Indies. All the three sorts have a very near relation; they keep themselves, however, distinct in our gardens. It flowers from July to November. Introduced 1802.

4. *BASSELLA CORDIFOLIA* (heart-leaved Malabar Nightshade). *Leaves cordate-roundish; peduncles simple, shorter than the leaf.*—A native of the East Indies, with pale purple flowers, which appear from July to November. It generally attains to the height of six feet. Introduced 1802.

CULTURE. The species of this genus are cultivated in China as spinach plants, and are also raised about Paris for the same purpose. They are said to furnish a summer spinach, equal to that of the orache.—They are propagated by seeds, which should be sown on a hot-bed in spring; and when the plants are fit to remove, they should be each planted into a separate pot filled with rich earth and plunged into the tan-bed, where they must be treated in the same manner as other tender exotics. They may also be propagated by cuttings, which should be laid to dry a day or two after they are taken from the plants, before they are planted, that the wound may heal, otherwise they will rot. These cuttings must be planted into pots filled with light fresh earth, and plunged into a moderate hot-bed of tanners bark, where they will take root in a fortnight or three weeks' time, when they should be treated in the same manner as the seedling plants. But as these rise so easily from seeds, it is seldom they are propagated any other way, because they are plants of short duration. These flower from June to autumn, and the seeds ripen in November and December.

These plants will climb to a considerable height, and send forth a great number of branches, so that they should

have a place near the back of the stove, where they may be trained up to a trellis, or fastened to the back of the stove, otherwise they will twist themselves about whatever plants stand near them, and be very injurious to the other plants; whereas, when they are regularly trained to a trellis, they will have a good effect in adding to the variety.

BASSIA (so named by Knoch in honour of F. Bassi, curator of the botanic garden at Bologna).

Class Dodecandria Monogynia. Nat. Ord. *Sapotæe*.

The Characters are—*Sepals four; corolla eight cleft, with an inflated tube; stamens 10; drupe five-seeded.*

1. *BASSIA LATIFOLIA* (broad leaved Bassia). Rox. cor. l. t. 19. *Leaves elliptical, acute; peduncle one flowered, nodding, terminal.*—This very useful tree, the wood of which is hard, very strong, and proper for naves of wheel-carriages, &c., is of a middling size, a native of the mountainous parts of the coasts of Coromandel, and casts its leaves during the cold season; they appear again with the flowers in March and April. The leaves are from four to eight inches long, and from two to four broad. The seed is ripe in July or August.

On the apices of the flowers, before they open, there is frequently a drop of a whitish, soft, tasteless resin to be found. The flowers are eaten raw by the natives of the mountainous parts of the circars; the Jackals also eat them. They have a sweet spirituous taste, and a spirit, which is strong and intoxicating, is distilled from them. The seeds yield a large quantity of oil by expression, which is thick, and of a quality inferior to castor oil, and used only by the poorer people to burn. Introduced 1799.

2. *BASSIA LONGIFOLIA* (long leaved Bassia). Lam. t. 308. *Leaves lanceolate; peduncles one-flowered, very long, horizontal, axillary.*—This is a lofty tree, with the outmost branches recurved, thickish, and covered with a gray down. Leaves on the extreme branches alternate, approximating, petioled, ovate-lanceolate, quite entire, acute, veined, naked, half a foot long, deciduous. Petioles roundish, short. Peduncles axillary, one to five, simple, filiform, one-flowered, upright; after the time of flowering, prolonged pen-

dulous. Berry fleshy, milky, with five seeds, one in each cell; they are oblong, very slightly compressed, sometimes acuminate at each end, sometimes only at the base, very smooth, shining, yellow with a white band. Native of Malabar and Ceylon. Introduced 1811.

CULTURE.—The species of this genus are tall trees, natives of the hottest part of the East Indies. They may be increased by cuttings, which root freely under a hand-glass in sand. They require to be kept constantly in the stove, in a mixture of light loam and peat.

BASTARDIA.

Class Monadelphia Polyandria. Nat. Ord. *Malvaceæ*.

The Characters are—*Carpels* 7-8, *awnless*.

1. *BASTARDIA VISCOSA* (viscous Bastardia). Sloan. his. j. t. 139. f. 4. *The leaves cordate, ovate, acuminate, finely serrated, tomentose, viscid.*—The plant is from two to four feet high; the leaves are small, and the flowers yellow. The whole plant is clammy, and smells very strong. Browne remarks, that this little shrubby plant seldom rises above four or five feet in height; that the trunk is pretty woody, and covered with a whitish bark; the leaves and smaller branches a little villous; and that the seed-vessels are few, flattened at top, and composed of many cells. Native of Jamaica, and according to Louriero, of Cochinchina; flowering in July and August. Introduced 1822.

2. *BASTARDIA FORTIDA* (stinking Bastardia). L. her. stirp. l. t. 55. *Leaves cordate, ovate, acute toothed, downy on each side; pedicels and petiole hairy; stipules setaceous, spreading.*—This differs from the preceding in the leaves not being acuminate or hairy, but soft, with a very fine nap, much larger and grossly toothed. It is an annual, native of Peru, flowering in July and August. Introduced 1798.

CULTURE.—The species of this genus are free flowerers of no great beauty, they may be increased by seeds, (which they produce freely) planted in common soil. The plants require to be kept in the bark stove.

BATSCHIA (named in honour of J. G. Batsch, a German professor of botany in the University of Jena).

Class Pentandria Monogynia. Nat. Ord. *Boraginæ*.

The Characters are—*Calyx* deeply five-parted; *corolla* hypocrateriform, with a hairy ring at the base inside, an open orifice, and rounded segments; *stigma* emarginate; *seeds* hard, shiny.

1. *BATSCHIA GMELINI* (Gmelin's Batschia). *Hairy; floral leaves ovate; calyx long, lanceolate.*—An ornamental perennial, six to nine inches high, native of Carolina. It forms a very pretty shrub.

The flowers are yellow, and appear from May to July. Introduced 1812.

2. *BATSCHIA LONGIFLORA* (long-flowered Batschia). *Silky; leaves linear; calyx long, linear; corolla crenate; tube long.*—A native of the Missouri, growing to the height of seven or eight inches, with yellow flowers, which are produced in great profusion from May to July. Introduced 1812.

CULTURE.—The species of this genus are very pretty hardy plants, that thrive well in common soil. They are increased by seeds, or by dividing the roots.

BAUERIA (named after Francis and Ferdinand Bauer, German Botanical draughtsman of the highest celebrity. Nothing comparable to their works has ever appeared from any other hand).

Class Polyandria Dignyia. Nat. Ord. *Cunoniceæ*.

The Characters are—*Calyx* seven-nine leaved, persistent; *petals* seven-nine deciduous; *capsule* inflated, two-celled, many-seeded.

BAUERA RUBIÆFOLIA Madder-leaved Bauera). Bot. mag. t. 715. *Leaves ternate, toothed at the point, sessile, opposite.* This handsome shrub, a native of Port Jackson, New Holland, requires the shelter of a green-house or conservatory, and during most part of the summer and autumn. The stem is five or six feet high, much branched, woody, round, leafy, somewhat hairy. Leaves opposite, sessile; evergreen, widely spreading; leaflets three quarters of an inch long, lanceolate beneath, their upper surface convex, of a deep shining green, under paler. Flowers axillary, on simple hairy stalks, longer than the leaves, a little drooping, scarcely an inch broad, of a beautiful rich rose colour, with yellow anthers, indorous. The parts of the flower vary occasionally in number, from seven to nine or ten. The branches, like the leaves, are sometimes three together,

and when young, have like them a reddish tinge, which the permanent calyx and the old leaves likewise assume.

It is a plant of easy culture in sandy loam and peat, and cuttings root in the same soil under a glass.

2. *BAUERA HUMILIS* (dwarf Bauera). Bot. cab. t. 1197. This species is only known to us by its being described in the Botanical Cabinet. Messrs. Loddiges say, "they raised it from seeds received from New South Wales, about the year 1804. It is a neat growing close bushy shrub, flowering in summer and autumn. It requires the greenhouse, and may be increased readily by cuttings: the soil should be loam and peat."

BAUHINIA (so named by Plumier in honour of those famous Botanists, John and Caspar Bauhin).

Class Decandria Monogynia. Nat. Ord. *Leguminosa*.

The Characters are—*Calyx five-cleft, deciduous; petals spreading, oblong, clawed; the upper one more distant; all inserted in the calyx.*

1. *BAUHINIA DIVARICATA* (dwarf Bauhinia). *Leaves smooth; lobes divaricate, acute, two-nerved; petals lanceolate.*—It grows naturally in great plenty on the north side of the island of Jamaica. This is a low shrub, seldom rising more than five or six feet high, but divides into several branches garnished with oval leaves, divided into two lobes, which spread from each other. The flowers grow in loose panicles at the end of the branches, are white, and have a very agreeable scent. These appear the greatest part of summer, and is one of the great beauties of the hot-house. The flowers are succeeded by taper pods, about 4 inches long, each containing four or five roundish compressed seeds of a dark colour. Introduced 1742.

2. *BAUHINIA AURITA* (long-eared Bauhinia). *Leaves at the base nearly transverse; lobes lanceolate, porrect, three-nerved; petals lanceolate.*—A shrub four to six feet high, with white flowers that are produced in August and September. It is a native of Jamaica, and was introduced 1751.

3. *BAUHINIA ACUMINATA* (acute-leaved Bauhinia). Rheed. m. t. 34. *Leaves ovate; lobes acuminate, half-ovate, spreading; leaflets connected*

beyond the middle, parallel, four-nerved.

—Grows naturally in both Indies, where it rises with several pretty strong, upright, smooth stems, sending out many slender branches, garnished with oval leaves, deeply divided into two lobes. The leaves come out without order, and have long footstalks, but are much thinner than those of the species before-mentioned. The flowers come out at the extremity of the branches, three or four in a loose bunch; the petals are red, or striped with white, others are plain upon the same branch; the stamina and style are white, and stand out beyond the petals. These flowers are succeeded by long flat pods of a dark brown colour, each containing five or six roundish compressed seeds. The wood of this tree is very hard, and veined with black, from whence the inhabitants of America call it Mountain Ebony.

Flowers in July and August. Introduced 1808.

4. *BAUHINIA GRANDIFLORA* (great-flowered Bauhinia). Hook. bot. misc. t. 91. *Leaves roundish, cordate at the base, tomentose beneath; leaflets connected to the middle, ovate, obtuse, 3-4, nerved.*—A shrub, native of Peru. Flowers white. Peduncles one-three flowered, constituting a raceme. Introduced 1820.

5. *BAUHINIA FORFICATA* (pincer-leaved Bauhinia). *Stem prickly; leaves cordate with porrect four-nerved lobes.*—A shrub four to six feet high. Flowers white. Native of Brazil. Introduced 1823.

6. *BAUHINIA EMARGINATA* (emarginate-leaved Bauhinia). *Stem prickly; leaves cordate at the base; tomentose beneath; leaflets orbicular, connected almost to the apex.*—It seldom rises more than ten feet high, dividing into irregular branches, armed with short crooked spines; the leaves grow alternate, are heart-shaped, and have two roundish lobes; they are woolly on the under side, and have short foot-stalks. The flowers grow at the extremity of the branches, two or three together; these are large, and of a dirty white colour, and are succeeded by short flat pods, each containing two or three seeds. Native of Carthagenæ.

7. *BAUHINIA PARVIFLORA* (small-flowered Bauhinia). *Racemes axillary*

and terminal, nodding; petals linear: lobes of leaves rounded, smooth.—A shrub, five to six feet high. Native of the East Indies. Introduced 1808.

8. *BAUHINIA VARIEGATA* (variegated flowered Bauhinia). *Leaves cordate at the base, glabrous; leaflets broadly-ovate, obtuse five-nerved, connected beyond the middle.*—This rises with a strong stem, upwards of twenty feet high, divided into many strong branches. The flowers are large, and grow in loose panicles at the extremity of the branches, of a purplish-red colour, marked with white, and the bottom yellow. The pods are about six inches long, and three quarters of an inch broad, containing three or four compressed seeds in each. It grows naturally in both Indies; and was introduced here in 1690, by Mr. Bentick. Flowering in June and July.

9. *BAUHINIA TOMENTOSA* (tomentose Bauhinia). Rheed. m. t. 35. *Leaves cordate, half-orbicular, downy.*—This grows from six to twelve feet in height, with a trunk nearly six inches in diameter, and divides into many branches. The leaves have a strong scent, especially if rubbed during the night, when the lobes are clapped together. The flowers have a green calyx, and a bell-shaped, yellowish-white corolla; one of the petals has a dusky red purple spot at the claw, resembling a small leaf. Stamens yellowish-white. The flowers have no smell. The native practitioners of India prescribe the dried leaves and young flowers of this plant in certain dysenteric affections. Native of Ceylon. Introduced 1808.

10. *BAUHINIA ANGUINA* (snake Bauhinia). Rox. cor. t. 285. *Stem climbing, regularly flexuous, compressed, circliferous; leaves glabrous, cordate; leaflets three-nerved; in the younger plants they are connected to the middle, and very much acuminate; in the adult plants they are connected almost to the apex, and ending in a short acumen.*—Dr. Roxburgh says "this is the most extraordinary as well as one of the most extensive ramblers he had ever met with." It is a native of the mountainous tracts in the vicinity of Silhet, Chittagony, &c.; and the most regular serpentine pieces of the stems, which resemble the letters Y or T, are carried about by numerous mendicants to keep serpents off. Flowering at the ends of the rains, and

the seed ripening in the cool season. The wood is hard but porous, and nearly white; the bark is rough; the stems and large branches flat, four to six inches broad, half an inch thick. Introduced 1818.

11. *BAUHINIA PURPUREA* (purple flowered Bauhinia). *Branches terete; leaves cordate at the base, coriaceous; when young clothed with rufous tomentum, but at length becoming glabrous.*—This also is a tall tree, differing from *B. variegata* in having larger leaves, more deeply cut and a little more contracted on the sides. In the flowers the calyx is yellowish-green and red; the corolla is of a very red purple, and one petal out of the five is streaked with white on the claw both within and without; they are all lanceolate and distant. The legumes are larger than those of any other sort, being an inch and a half in length, and an inch in breadth. Native of the East Indies where it flowers the whole year. Introduced 1778.

12. *BAUHINIA LAMARKIANA* (Lamarck's Bauhinia). *Leaves cordate at the base, glabrous above, pubescent on the nerves beneath; leaflets joined together to the middle, two-nerved, free parts bluntish, diverging.*—A herb six feet high, with white flowers; they appear from June to August. Native of South America. Introduced 1818.

13. *BAUHINIA SPATHACEA* (spathaceous-calyxed Bauhinia). *Leaves glabrous, emarginately cordate both at the base and apex; leaflets connected beyond the middle, two-nerved, free parts oval, obtuse.*—A shrub six feet high, native of New Spain. The flowers appear in June and July; they are four-petalled and white. Introduced 1825.

14. *BAUHINIA SUBROTUNDIFOLIA* (Roundish-leaved Bauhinia). *Leaves hardly cordate at the base, clothed with hairy tomentum beneath; leaflets connected to the middle, ovate, obtuse, almost semi-orbicular.*—In this species the flowers are red, and are produced from June to August. It is a native of Calava near Manila, and in the vicinity of Acapulco, where it attains generally the height of five or six feet. Introduced 1816.

15. *BAUHINIA PORRECTA* (stretched out Bauhinia). *Leaves cordate at the base with the nerves on the under side as well as the petioles and branches puberulous; leaflets connected to about*

the middle, ovate, acuminate, three-four nerved, nearly parallel.—This rises to about fifteen feet in height, having several straight trunks about the thickness of a man's leg, covered with a whitish bark, dividing into many branches and twigs, making a pleasant top. The leaves are three inches long and two broad in their broadest part, yellowish green, smooth, thin, having seven or more ribs, with some transverse ones, making the whole very nervous. The petioles are an inch long. The flowers come out at the end of the twigs several together, on pedicels half an inch in length. Petals long, red, white, variegated or striated. Stamens long and white. Legumen five or six inches in length, brown.

It grows on the hills every where in Jamaica. The wood is very hard and veined with black, whence the name of ebony. Flowers in July. Introduced 1739.

16. *BAUHINIA LATIFOLIA* (broad-leaved Bauhinia). *Leaves ovate at the base, young ones, petioles, and branchlets puberulous; leaflets connected beyond the middle, broadly ovate, three-nerved, acute, and rather diverging at the apex.* A shrub, native of New Spain. It rises to the height of five or six feet. The flowers white. They appear in July and August. Introduced 1825.

17. *BAUHINIA CANDIDA* (white-flowered Bauhinia). *The leaves cordate, the base, pale and pubescent beneath; leaflets connected a little beyond the middle, ovate, oblong, bluntish.*—It rises to the height of five or six feet, and forms a very ornamental shrub, with a profusion of white flowers in May and June. It is a native of Java and other parts of the East Indies. Introduced 1777.

18. *BAUHINIA ACULEATA* (prickly-stalked Bauhinia). *Plu. ic. t. 44. f. 1. Stem prickly; leaves rather cordate; leaflets ovate, obtuse, three-nerved, connected to the apex.*—This is an erect, inelegant shrub, five or six feet high. The trunk and branches are very prickly. The flowers are large, white, and have a scent which is somewhat unpleasant. In Jamaica it grows plentifully, and often rises to the height of sixteen or eighteen feet. The stalks are terminated by several long spikes of flowers, which are succeeded by

bordered pods, about three inches long, containing two or three swelling seeds. These pods are glutinous, and have a strong balsamic scent, as have also the leaves when bruised. It is called in America, the *Savin-tree*, from its strong odour, somewhat resembling common savin. It flowers from June to August. Introduced 1737.

19. *BAUHINIA RUFESCENS* (Rufescent Bauhinia). *The leaflets distinct, semiorbicular, three-nerved, glabrous.*—This species is a native of Senegal, and Gambia, and the Cape of Good Hope. It rises to the height of five or six feet. The flowers pale-red. Introduced 1816.

20. *BAUHINIA UNGULA* (Clawed-petalled Bauhinia). *The leaves ovate at the base, clothed with soft villi; leaflets connected beyond the middle, ovate, obtuse, parallel, three-nerved.*—A shrub five to six feet high, native of Caracass. Flowers white, axillary. Introduced 1817.

21. *BAUHINIA PUBESCENS* (Pubescent Bauhinia). *The leaves rather cordate at the base, pubescent beneath and on the petioles; leaflets oval, obtuse, connected beyond the middle, four-nerved, nearly parallel.*—An ornamental shrub four to six feet high. The flowers are large, white, and much crowded. Native of the West Indies. Introduced 1823.

22. *BAUHINIA MULTINERVIA* (Many nerved-leaved Bauhinia). *The leaves elliptic, rounded at the base, membranous, shining above, but rather pilose beneath, the nerves ferruginous; leaflets semi-ovate, obtuse, five-nerved.*—A tree twenty feet high, with racemose snow-white flowers; they are succeeded by legumes nine-twelve inches long. Native of Caraccas. Introduced 1817.

23. *BAUHINIA RACEMOSA* (Racemose flowered Bauhinia). *The leaves cordate at the base, clothed with silky villi beneath as well as on the peduncles, petioles, branches, calyxes and petals; leaflets broadly ovate, obtuse, connected to the middle, five-nerved.*—A climbing shrub; native of the East Indies. Introduced 1790.

24. *BAUHINIA UNGULATA* (Ungulated petalled Bauhinia). *Leaves ovate at the base; leaflets connected to the middle, oval, oblong, parallel with the inner side, straight.*—It grows naturally at Campeachy, from whence I received the

seeds; and rises to the height of twenty feet, with a smooth stem, dividing into many small branches, garnished with oblong heart-shaped leaves, having two pointed parallel lobes, which have each three longitudinal veins. The leaves are placed alternately on the branches, which are terminated by loose bunches of white flowers; these are succeeded by very long narrow compressed pods, which have eight or ten compressed roundish seeds in each.

25. *BAUHINIA ROTUNDATA* (rounded leaved Bauhinia). *The leaves somewhat cordate at the base; lobes rounded.*—This rises twenty feet high, with a strong upright stem, which sends out many branches towards the top; armed with spines growing by pairs, which are strong and crooked. The leaves are heart-shaped and grow alternately, having two rounded lobes. The flowers are large and white, coming out thinly at the end of the branches. The petals of these are near two inches long, and spread open wide; the stamens and style are nearly of the same length. The flowers are succeeded by long flat pods, which are narrow, each containing five or six seeds.

26. *BAUHINIA PAULETIA* (Paulet's Bauhinia). *The leaves glabrous, ovate at the base; leaflets ovate, obtuse, parallel, four-nerved, connected beyond the middle.*—A shrub six to eight feet in height. The peduncles axillary, two-flowered, constituting a leafy raceme. The flowers yellowish-red. Native of the vicinity of Panama. Intro. 1820.

27. *BAUHINIA TRIANDRA* (Triandrous Bauhinia). *The leaves roundish, glabrous; leaflets joined to the middle, four-nerved.*—A native of the East Indies. The racemes are axillary and terminal. Flowers white; legume stipitate, pubescent. Introduced 1823.

28. *BAUHINIA RETUSA* (retuse-leaved Bauhinia). *The leaves cordate at the base, and emarginately retuse at the apex, coriaceous, glabrous; leaflets connected nearly to the apex, five-nerved.*—A native of Bengal. Flowers white; petals oval. Introduced 1820.

29. *BAUHINIA COCCINEA* (scarlet-flowered Bauhinia). *The leaves shining and rufous beneath, cordate; leaflets four-nerved connected to the middle, semi-ovate, acuminate.*—A splendid species; native of Cochin China, in woods,

&c. The stem is compressed, unequal. Branches climbing. Racemes on long peduncles, pendulous, large. The petals of the flower are ovate and of a beautiful scarlet colour. Legume many seeded. Introduced 1826.

30. *BAUHINIA GUIANENSIS* (Guiana-Bauhinia). Aubl. guian. t. 145. *The leaflets free to the base, semi-ovate, acuminate, four-nerved, parallel.*—A climbing shrub, native of Guiana, in woods. The leaves are green on both surfaces. The flowers are white. Introduced 1820.

31. *BAUHINIA CUMANENSIS* (Cumana Bauhinia). Bot. reg. t. 1133. *The leaves cordate at the base, pubescent beneath; leaflets membranous, ovate, acutish, four-nerved, hardly connected to the middle.*—A native of Cumana. Flowers white. The stem is sarmentose. Branches glabrous. Introduced 1824.

32. *BAUHINIA LINGUA* (tongue-leaved Bauhinia). *Leaves clothed with rufous villi beneath, cordate; leaflets three-nerved, semi-ovate; connected almost to the middle.*—This rises with many slender stalks, which put out tendrils, and fasten themselves to the neighbouring trees, whereby they rise to a great height. Leaves alternate, heart-shaped, on long foot-stalks; they are six inches long, and three inches and a half broad in the middle, and are deeply cut into two pointed lobes, each having three prominent ribs running longitudinally. It is a native of both Indies, and has not produced flowers in England. The seeds were sent to Mr. Miller from Campeachy, probably before the year 1742.

The flowers are at first whitish, but turn to a yellowish colour. They seem to appear but seldom even in their place of natural growth. The fruit is slender and flat, half a foot or a palm in length, and an inch in breadth, hard, smooth, very dark brown; it contains six or eight flat bony seeds, black with a silvery border.

CULTURE.—The species of this genus merit a place in the stove, where they are easily cultivated. In their native woods, they are great ornaments of the trees, among which they climb in every direction.

All these plants being natives of hot countries, will not thrive in England.

nless they are kept in the bark-stove. They are propagated by seeds, which must be procured from the countries where they grow naturally, for they do not perfect their seed in England.

The seeds should be brought over in their pods, which will preserve them good. These must be sown in pots filled with light fresh earth, and plunged into a moderate hot-bed of duners bark; if the seeds are good, the plants will come up in about six weeks, and in a month after, will be fit to transplant, when they should be carefully shaken out of the seed-pot, so as not to tear off the roots, and each planted into a separate small pot filled with light loamy earth, and plunged into the hot-bed again, being careful to shade them until they have taken fresh root, after which they should have fresh air admitted to them every day in warm weather. In the autumn they must be placed in the bark-stove, and treated in the same way as other tender exotics, giving them but little water in winter. As these plants frequently flower, they are worthy of a place in the stove.

BEAUFORTIA (a truly noble genus, consecrated by Mr. Brown to the memory of Mary, Duchess of Beaufort, who died January 7th, 1714, in the 85th year of her age. Her Grace cultivated a number of rare plants. A splendid herbarium in the British Museum, found in several large folio volumes, bears the title of "The Duchess of Beaufort's Plants").

Class Polyadelphia Polyandria. Nat. Ord. *Myrtacæ*.

The Characters are—*Parcels of stamens 5, opposite the petals; anthers inserted at the base, bifid at the end with deciduous lobes; capsule three-celled, one-seeded cuneate, and included in the thickened tube of the calyx which is torn by the base of the branch.*

1. **BEAUFORTIA DECUSSATA** (Decussate-leaved Beaufortia). Bot. reg. t. 18. *Leaves opposite, decussate, ovate, or oval, many nerved; bundles of stamens on very long claws; filaments radiating.*—A green-house shrub, flowering in the spring, and increased by cuttings. The branches are angular. Leaves sessile, crowded, half or three quarters of an inch long, recurved, smooth, rigid, entire, full of pellucid dots, pale beneath. Flowers in dense tufts, surrounding the

branches here and there, most conspicuous for their spreading tufts of stamens, an inch and a quarter or more in length, all over a rich scarlet, the petals as well as the calyx being green. Gathered by Mr. Brown on the south-west coast of New Holland, where it grows from three to ten feet in height. It was introduced 1803.

2. **BEAUFORTIA CARINATA** (keeled-leaved Beaufortia). *Leaves opposite, decussate, many nerved, keeled on the back, ovate, glaucous.*—This species makes a splendid appearance. The flowers of a scarlet colour, are produced in great abundance. It is a very desirable object, and should form a part in every collection of green-house plants. Native of New Holland, from two to four feet in height. Introduced 1829.

CULTURE. The species of this genus grow well in an equal mixture of peat, loam, and sand. They may be increased by cuttings, which root freely in a pot of sand, with a bell-glass over them. The cuttings should not be too ripe.

BEAUMONTIA (named by Dr. Wallick, in compliment to the late Mrs. Beaumont of Bretton Hall, in Yorkshire.

Class Pentandria Monogynia. Nat. Ord. *Apocynæ*.

The Characters are—*Sepals foliaceous, equal, erect; corolla infundibuliform; tube short; limb large, campanulate, five-lobed; lobes erect; stamens inserted into the base of the tube; anthers sagittate, enclosing the fusiform stigma.*

BEAUMONTIA GRANDIFLORA (large-flowered Beaumontia). Bot. reg. t. 911. *Leaves opposite, stalked, oblong, blunt, point-letted, narrowed towards the base, flat, smooth, a little downy beneath.*—

This fine plant is a native of Chittagong, where it flowers from the beginning of November to the end of June. The flowers are white and very large, and produced in many flowered terminal or axillary corymbs. The leaves are of a shining dark green. It grows well in peat and loam, and cuttings root freely in sand, under a hand-glass in heat. They require to be kept in the stove. Introduced 1818.

BEE. The domestic bee differs in a variety of particulars from most other animals, and admits of a three-fold description, under its various characters of **QUEEN-BEE**, **DRONE-BEE**, and **WORKING-BEE**, for although this last kind is, strictly speaking, the only honey-bee,

yet as all the three kinds are found, and seem to be necessary in every community or hive of bees, they go under the same general name of *APIS MELLIFICA*; whilst they differ so much from each other (more indeed than some different species of the same genus in other animals) that a particular and separate description of each is necessary.

The **DRONES** may easily be distinguished from the common or working bees. They are both longer and larger in the body. Their heads are round, their eyes full, and their tongues short. The form of the belly differs from both those of the queen and common bees; and their colour is darker than either. They have no sting, and they make a much greater noise when flying than either the queen or the common bees; a peculiarity of itself sufficient to distinguish them. That the drones are males has been satisfactorily ascertained by dissecting them. If a hive is opened in the beginning of spring, not a single drone will be found in it, but from the middle of May to the end of June hundreds will be found, commonly from two hundred or three hundred to one thousand. From August to the following spring there are none to be found. They do not go out until eleven in the morning, and return before six in the evening. They collect no honey; their rostrum and feet are not adapted for collecting either wax or honey; nor are they obliged to labour. They only hover upon the flowers to extract the sweets, and all their business is pleasure. Their office is thought to be to impregnate the eggs of the queen after they are deposited in the cells; and while their presence is thus necessary, they are suffered to enjoy life; but as soon as they become useless in the hive, the working-bees declare a war of extermination against them. This war affects not only the drones already in life, but even the eggs and maggots in the drone cells; for after the season proper for increasing the number of bees is past, every vestige of the drones is destroyed, to make room for honey.

Mr. Börner, however, one of the latest and best writers on the subject, doubts the long established doctrine of the fecundating powers of the drones. He urges the following, among many, arguments:—"That the queen stands in no need of their assistance to fecun-

date or impregnate her, appears from this consideration; that she lays eggs which produce young bees, without having had any previous communication with the drones. I will not, however, suppose that the drones are of no use in the hive; but that the queen lays eggs which produce young bees, without so much as seeing a drone, I can with the utmost confidence affirm. The advocates for the old doctrine, that the drones are males, allege, that they impregnate the queen, before their brethren kill them. According to this theory, she should continue for no less a period than seven or eight months, with about twelve thousand impregnated eggs in her ovarum, which would certainly make her appear very large during the whole of that period. But it is unnecessary to waste arguments in refutation of this doctrine, as I have repeatedly had queens breed and lay eggs and those eggs become bees, although these queens were bred seven months after all the drones were dead, and some weeks before any new ones were hatched. These experiments, I think, are sufficient to silence all the arguments advanced by the advocates for the drone system.

"Mr. Debraw, indeed, creates little drones, and gives them power to live all the year, and to impregnate the queen at pleasure. But as room does not permit me to narrate the experiments whereby he attempts to prove this, I shall content myself with stating his sentiments in as few words as possible. He asserts, that, besides the common large drones, which every person acquainted with bees knows at first sight, there is a small kind of drones, which are, to all appearance, like the common bees, there being no visible difference, except that they have no sting, which he discovers by immersion in water, and pressure. After relating an experiment on this head, he says, 'I once more immersed all the bees (of a small swarm) in water, and when they appeared to be in a senseless state, I gently pressed every one of them between my fingers, in order to distinguish those armed with stings from those that had none, which last I might suspect to be males. Of these I found fifty-seven exactly of the size of common bees, yielding a little whitish liquor on being pressed between the fingers.'

In answer to this, I shall here narrate an experiment I made several years ago. On the 1st of September, 1787, I took all the bees out of a hive that was breeding very fast, and in which I found only four drones: these I killed. I put the bees into a hive that had nothing in it but empty combs. After waiting ten days, upon looking between the combs, I found maggots, newly up, in the cells. I then took out all the bees, and shook them into a tub full of water, from which immersion I recovered them gradually, and while doing this, I pressed each bee individually, to try if I could discover any of those stingless little drones; but not one appeared, all of them having stings, to the number of three thousand. After this I searched the old hive I had taken them out of, and cut out all the combs that had eggs or young in them; among which I found some cells that had new eggs in them; others whose eggs were converted into a small worm, and some others with maggots in them. I then restored the queen, and all the bees, putting them into the same hive again, but without leaving a single egg in it. During the succeeding twenty days, I inspected the hive, and found the bees, in fine weather, working with great alacrity, a sure sign that the queen was breeding again. After this, on turning up the hive, and cutting out one of the brood combs, I found new-laid eggs in some of them; others containing maggots; besides some young bees, almost ready to emerge from their cells. I made another experiment, about the same time, upon a hive that had some brood combs, but had not had a large drone for several weeks preceeding. This hive did not contain above five hundred bees, a circumstance that was in my favour; as being less numerous, the trouble was proportionally less. I carried the hive into a close room in my house, that not a single bee might escape me; but after repeating the former experiment of immersing them in water, recovering, and pressing them one by one, I found that every one of them had a sting. These experiments must satisfy any unprejudiced person, that there is no such creature in existence as a *small drone bee*.

"The QUEEN (continues Mr. Bonner), is easily distinguished from all the other bees in the hive, by the form,

size, and colour of her body. She is considerably longer, and her wings are much shorter in proportion to her body, than those of the other bees. The wings of both common bees and drones cover their whole bodies, whereas those of the queen scarcely reach beyond the middle, ending about the third ring of her belly. Her hinder part is far more tapering than those of the other bees: her belly or legs are yellower, and her upper parts of a much darker colour than theirs. She is also furnished with a sting, though some authors assert that she has none, having been induced to form this opinion, because she is extremely pacific; so much so, indeed, that one may handle her, and even tease her as he pleases, without provoking her resentment. For my part, I never can excite a queen to draw her sting, nor could I even get a sight of it, but when I pressed her body. The omniscient governor of nature has wisely ordained this majestic insect to be of a pacific disposition: for were she otherwise, were she like the other bees, of so irritable a temper as to draw her sting on every occasion, and to leave it in the body of her antagonist, it would prove of dangerous and often fatal consequence to the whole hive; for every bee, after losing its sting, dies within a day or two at the utmost. The queen bee is solemn and calm in her deportment. A young queen is a great deal smaller in size than a full grown one, being not much longer than a common bee, and is therefore not so easily observed when sought for. When only three or four days old, she is very quick in her motions, and runs very fast; but when pregnant with eggs, she becomes very large, and her body is heavy. When travelling, she drags along in a very slow manner, and is not very expeditious in flying. That this majestic insect is a *female*, the very designation she bears, of *queen* seems to imply that modern authors are convinced, though many of the ancients were of a different opinion. But as it is also now unanimously admitted, that she lays *every* egg in the hive, she ought rather to be called the **MOTHER BEE**.

"From the best observation that has been made, it appears she possesses and exerts no sovereignty over the

an equal regard for her welfare. Neither does it appear that she issues any positive orders, to be punctually obeyed by the other bees. The truth seems to be that she and the other bees are all equally acquainted with their duty by instinct, and have an equal pleasure in performing it, without waiting for orders from each other.

"That there is, nevertheless, the greatest order and regularity among them, is certain, for they lay their plans and execute them in the best possible manner, by the influence of the above powerful substitute for reason.

"Almost all writers are of opinion that the queen lays three different kinds of eggs, viz., *one* kind for the production of a queen bee, *another* species for that of the working bee, and a *third* for producing the drones. It was also long a received opinion, that no queen could lay eggs that were capable of producing bees, without the assistance of drones. Schirach refutes this doctrine, and entirely denies such an use of the drones. He advances this opinion, that 'the queen lays eggs which produce young bees, without any communication with the drones; and affirms that all the working bees are females in disguise; every one of whom, in an early stage of her existence, was capable of becoming a queen; from a knowledge of which fact, swarms may artificially be obtained from the early months of spring, and in any succeeding month, even to November.'

"His experiments have been very numerous, and obviate every doubt and objection. He performed the operation upon one and the same stock, for at least fifty or sixty times, from mere fragments of the combs, &c.

"This novel and wonderful doctrine excited no small contention, and not a few counter experiments among naturalists on the continent, without being decided.

"He asserts, which is indeed the grand and decisive proof, that 'the practice of this art, (of raising artificial queens) has already extended itself through Upper Lusatia, the Palatinate, Bohemia, Bavaria, Silesia, and several parts of Germany, and even of Poland.'"

again and again, I can now affirm, with the utmost confidence and certainty, that the common or working bees, are endowed with the powerful faculty of raising a queen bee from an egg in a common cell, when their community stands in need of one. Their method is this: they make choice of a common cell with an egg in it, and inject some white liquid matter from their proboscis, of a thickish substance. They then begin to build upon the edges of the cell, and enlarge it. On the third day it appears fairly on the outside of the comb, in the form of a royal cell, and may now be properly so denominated. On the fifth day, the cell being greatly enlarged, and a great deal of the whitish matter thrown into it, the royal maggot appears in the form of a semi-circle, not unlike a new moon, being biggest in the middle part, and small at each end. In this form it is to be seen for two days swimming on the top, and in the midst of the matter in the cell; and on the seventh day it is sealed up. During this period she undergoes various metamorphoses. I have opened the royal cell on the tenth day, and have found the maggot still on the top of the white liquor; and, taking it into my hand to show it to any friend, it would move for a short time, although at this period it had not the smallest resemblance to a bee, being still only a maggot. But on the fourteenth or fifteenth day, the metamorphosis is so complete, that instead of a gross white worm, it comes forth a charming young queen bee."

When a queen dies by any accident, the bees of her hive immediately cease working, consume their own honey, fly about their own and other hives at unusual hours, when other bees are at rest, and pine away if not soon supplied with another sovereign. Her loss is proclaimed by a clear and uninterrupted humming. This sign should be a warning to the owner of the bees to take what honey remains in the hive, or to procure them another queen. In this last case the flock instantly revives, and pleasure and activity are apparent through the whole hive. The dissection of the queen bee shows evidently

that she lays many thousand eggs. It is computed that the ovaria of a queen bee contain more than 5000 eggs at one time; and, therefore, it is not difficult to conceive that a queen bee may produce ten thousand or twelve thousand bees, or even more in the space of two months.

The WORKING or COMMON BEE is smaller than either the queen or the drone bee. They have four wings fastened to their middle part, by which they are not only enabled to fly with heavy loads, but also to make those well-known sounds and hummings to each other, which are supposed to be their only form of speech. They have also six legs fastened to their middle. The two foremost of these are the shortest, and with these they unload themselves of their treasures. The two in the middle are somewhat longer, and the two last are longest. On the outside of the middle joint of these last, there is a small cavity in the form of a marrow-spoon, in which the bees collect by degrees those loads of wax they carry home to their hives: this hollow groove is peculiar to the working bee. Neither the queen nor the drones have any resemblance to it. Each foot terminates in two hooks, with their points opposite to each other; in the middle of these hooks there is a little thin appendix, which when unfolded enables the insects to fasten themselves to glass or the most polished bodies. This part they likewise employ for transmitting the small particles of crude wax which they find upon flowers, to the cavity in their thighs. The honey bladder is a reservoir, in which is deposited the honey that the bee sips from the cups of the flowers, after it has passed through the narrow pipes that connect the head, breast, and belly of the bee. This bladder, when full, is of the size of a small pea, and is so transparent that the colour of the honey can be distinguished through it. The sting is situated at the extremity of the belly, and the head or root of it is placed contiguous to the small bladder that contains the venom. It is connected to the belly by certain small muscles, by means of which the bee can dart it out and draw it in with great force and quickness. In length it is about the sixth part of an inch. It is of a horny

substance; is largest at the root, and tapers gradually towards the point, which is extremely small and sharp; and when examined by the microscope, appears to be polished extremely smooth. It is hollow within like a tube, that the venomous liquor may pass through it when it strikes any animal, which it does the very instant that the sting pierces the skin, and insinuates itself into the wound, which proves mortal to many small insects, as well as to the bee herself when she leaves her sting in the wound, as it draws after it the bladder, and sometimes part of the entrails of the bee.

These working bees may be said to compose the whole community, except in the season of the drones, which hardly lasts three months. During all the other nine months, there are no other bees in the hive, except them and the queen.

In the Philosophical Transactions, No. clxxii. vol. i. we have an account of a species of honey bee found in some parts of America, very different in form and manners from the common bee of Europe. Their combs are composed of a series of small bottles or bladders of wax, of a dusky brown or blackish colour; and each nearly of the size and shape of a Spanish olive. They hang together in clusters, almost like a bunch of grapes, and are so contrived that each of them has its aperture, while the bees are at work upon it; but as soon as it is filled with honey, this aperture is closed, and the bees leave it and go to work upon another vessel. Their lodgings are usually taken up in the hollow of an old tree, or in some cavity of a rock by the sea-side. They are sagacious in choosing the most secure retreats, because their honey is so delicious a bait that they are hunted after by many animals; and they have no power of defending themselves, having no stings as our bees have. The combs are brittle, and the honey is clear and liquid like rock water. It is used by the natives rather as a drink with their food than as honey. They use it also in medicine as a purge, drinking half a pint of it in the morning fasting.

With regard to the *age of bees*, the drones live but a little while, being destroyed without mercy by the working bees, probably to save honey. As to

they live many years. Many of them, it is well known, die annually of hard labour; and though they may be preserved by succession in hives or colonies for several years, the most accurate observers are of opinion that their age is but a year, or no more than two summers at the outmost.

These industrious insects, Mr. Bonner remarks, "have their vices as well as their virtues." The most savage Indian tribes do not wage more deadly wars than the bees of different hives, and sometimes of the same hive, occasionally do.

In these battles, their stings are their chief weapons; and great skill may be discovered in their manner of pointing them between the scaly rings which cover their bodies, or to some other easily vulnerable part.

The bee which first gains the advantage, remains the conqueror; though the victory costs the victor his life, if he has left his sting in the body of the enemy; for with the sting so much of the body is torn out, that death inevitably follows.

Their fighting and plundering one another ought chiefly to be imputed, as Mr. Thorley observes, to their perfect abhorrence of sloth and idleness, or to their insatiable thirst for honey; for when, in spring or autumn, the weather is fair, but no honey can be collected from plants, and is to be found only in the hives of other bees, they will venture their lives to get it there. Sometimes one of the queens is killed in battle. In this case the bees of both hives unite as soon as her death is generally known among them.

All then become one people; the vanquished go off with the robbers, richly laden with their own spoils, and return every day with their new associates to pillage their own habitations.

Mr. Wildman, by his dexterity in the management of bees, some years ago, surprised the whole kingdom. He caused swarms to light where he pleased almost instantaneously: he ordered them to settle on his head, then removed them to his hand, and commanded them to depart and settle on a window, table, &c. at pleasure. We subjoin his method of performing these feats, in

and bottom, the queen immediately appears to know the cause of this alarm; but soon retires again among her people. Being accustomed to see her so often, I readily perceive her at first glance; and long practice has enabled me to seize her instantly, with a tenderness that does not in the least endanger her person. When possessed of her, I can without injury to her, or exciting that degree of resentment that may tempt her to sting me, slip her into my other hand, and, returning the hive to its place, hold her there, till the bees missing her, are all on wing, and in the utmost confusion. When the bees are thus distressed, I place the queen wherever I would have the bees to settle. The moment a few of them discover her, they give notice to those near them, and those to the rest; the knowledge of which soon becomes so general, that in a few minutes they all collect themselves round her, and are so happy in having recovered this sole support of their state, that they will long remain quiet in their new situation. Nay, the scent of her body is so attractive to them, that the slightest touch of her, along any place or substance, will attach the bees to it, and induce them to pursue any path she takes."

When the bees begin to work in their hives, they divide themselves into four companies, one of which roves in the fields in search of materials, another employs itself in laying out the bottom and partitions of their cells, a third is employed in making the inside smooth from the corners and angles, and the fourth company brings food for the rest, or relieves those who return with their respective burdens. But they are not kept constant to one employment; they often change the tasks assigned them; those that have been at work being permitted to go abroad, and those that have been in the fields already take their places. They seem even to have signs by which they understand each other, for when any of them want food, they bend down their trunks to the bee from whom it is expected, which then opens its honey-bag, and lets some drops fall into the mouths of the others, who have opened their mouths to receive it, although only one is served at a time.

Their diligence and labour are so great, that in a day's time, they are able to make cells, which lie upon each other, numerous enough to contain three thousand bees. In the plan and formation of these cells, they discover a most wonderful sagacity. In constructing habitations within a limited compass, an architect would have three objects in view; first, to use the smallest possible quantity of materials; next, to give the greatest capacity in a determined space; and thirdly, to employ the spot in such a manner that none of it may be lost. On examination it will be found that the bees have obtained all these advantages in the hexagonal form of their cells.

As the combs would be apt, when full, to overcome by their weight all the security which the bees can give them against falling, those who prepare hives set in them crosswise, sticks, which serve as props to the combs, and save the bees great labour.

It is not easy to discover the particular manner of their working; for, notwithstanding the many contrivances used for this purpose, there are such numbers in continual motion, and succeeding one another with such rapidity, that nothing but confusion appears to the sight.

Some of them, however, have been observed carrying pieces of wax in their talons, and running to the places where they are to work upon the combs. These they fasten to the work by means of the same talons. Each bee is employed but a very short time in this way; but there is so great a number of them that go on in a constant succession, that the comb increases very perceptibly. Besides these there are others that run about beating the work with their wings and the hinder parts of their body, probably with a view to make it more firm and solid.

Whilst part of the bees are occupied in forming the cells, others are employed in perfecting and polishing those that are new modelled. The operation is performed by their talons, taking off every thing that is rough and uneven. These polishers are not so desultory in their operations as those that make the cells; they work long and diligently, never intermitting their labour, except to carry out of the cells the particles of wax which they take off in polishing.

These particles are not allowed to be lost; others are ready to receive them from the polishers, and to employ them in some other part of the work.

One of the chief uses of the cells is to be nurseries for the young. The cells for those who are to be working bees are commonly half an inch deep; those for drones three quarters of an inch, and those which are intended for keeping honey still deeper. This accounts for the inequalities observed in the surface of combs. The queen bee is generally concealed in the most secret part of the hive, and is never visible but when she lays her eggs in such combs as are exposed to sight.

When she does appear, she is always attended by ten or a dozen of the common sort, who form a kind of retinue, and follow her wherever she goes with a sedate and grave step. Before she lays her eggs, she examines the cell where she intends to lay them; and if she finds that they do not contain either honey, wax, or embryo, she introduces the posterior part of her body into a cell, and fixes to the bottom of it a small white egg, which is composed of a thin membrane full of a whitish liquor. In this manner she goes on until she fills as many cells as she has eggs to lay, which are generally many thousands. Sometimes more than one egg has been deposited in the same cell; when this is the case, the working bees remove the supernumerary eggs, and leave only one in each cell. On the first or second day after the egg is lodged in the cell, the drone bee, or according to Mr. Bonner, the working bee, injects a small quantity of whitish liquid, which in about a day is absorbed by the egg. On the third or fourth day is produced a worm or maggot, which when it is grown so as to touch the opposite angle, coils itself up in the shape of a semicircle, and floats in a proper liquid, whereby it is nourished and enlarged in its dimensions. This liquor is of a whitish colour, of the thickness of cream, and of an insipid taste, like flour and water.

Naturalists are not agreed as to the origin and qualities of this liquid. Whatever be the nature of this aliment, it is certain that the working bees are very industrious in supplying the worms with a sufficient quantity of it. The worm is fed by the working bees for

about eight days, till one end touches the other in the form of a ring; and, when it begins to feel itself uneasy in its first posture, it ceases to eat and begins to unroll itself, thrusting that end forwards to the mouth of the cell which is to be the head. The attendant bees, observing these symptoms of approaching transformation, desist from their labours in carrying proper food, and employ themselves in fastening up the top of the cell with a lid of wax, formed in concentric circles, and in cherishing the brood and hastening the birth by their natural heat. In this concealed state the worm extends itself at full length, and prepares a web of a sort of silk, in the manner of the silk worm. This web forms a complete lining for the cell, and affords a convenient receptacle for the transformation of the worm into a nymph or chrysalis. In the space of eighteen or twenty days the whole process of transformation is finished, and the bee endeavours to discharge itself from confinement, by forcing an aperture with its teeth through the covering of the cell. The passage is gradually dilated, so that one horn first appears, then the head, and afterwards the whole body. This is usually the work of three hours, and sometimes of half a day. The bee, after it has disengaged itself, stands on the surface of the comb till it has acquired its natural complexion, and full maturity and strength, so as to become fit for labour. The rest of the bees gather round it in this state, congratulate it on its birth, and offer it honey out of their own mouths. The exuviae and scattered pieces of wax which are left in the cell are removed by the working bees; and the matrix is no sooner cleansed and fit for new fecundation, but the queen deposits another egg in it; insomuch that Mr. Maraldi says he has seen five bees produced in the same cell, in the space of three months. The young bees are easily distinguished from the others by their colour; they are gray, instead of the yellowish brown of the common bees.

The eggs from which drones are to proceed, are laid in larger cells than those of the working bees. The coverings of these cells, when the drones are in the nymph state, are convex or swelling outward, whilst the cells of the working bees are flat.

This, with the privilege of leading idle effeminate lives, and not working for the public stock, is what distinguishes the drones.

The bees depart from their usual style of building, when they are to raise cells for bringing up such maggots as are destined to become queens. These are of a longish oblong form, having one end bigger than the other, with their exterior surface full of little cavities. Wax, which is employed with so geometrical a thriftiness in the raising of hexagonal cells, is expended with profusion in the cell which is to be the cradle of the royal maggot. They sometimes fix it in the middle, and at other times on one side of a comb. Several common cells are sacrificed to serve as a basis and support to it. It is placed almost perpendicular to the common cells, the largest end being uppermost. The lower end is open till the season for closing it comes, or till the maggot is ready for transformation. It would be difficult to conceive how a tender maggot can remain in a cell turned bottom upmost, if we did not find it buried in a substance scarcely fluid, and if it was not in itself, at first, small and light enough to be suspended in this clammy paste. As it grows it fills all the upper and larger part of the cell. As soon as the young queen comes out of her cell, that cell is destroyed, and its place is supplied by common cells; but as the foundation of the royal cell is left, this part of the comb is found thicker than any other. There are several such cells prepared; for, if there were only one reared in each hive, the swarm might often want a conductress. Many accidents might also destroy the little maggot before it becomes a bee. It is therefore necessary that a number of such cells should be provided; and accordingly there are observed several young queens in the beginning of the summer, more than one of which often takes flight when a swarm departs. A young queen is in a condition to lead a swarm from a hive in which she was born, in four or five days after she has appeared in it with wings. The bees of a swarm are in a great hurry when they know their queen is ready to lay. In this case they give their new cells but part of the depth they are to have, and defer the finishing

of them till they have traced the number of cells requisite for the present time. The cells first made are intended only for working bees; these being the most necessary.

Bees seem to be warned of the appearance of bad weather by some particular feeling. It sometimes happens, even when they are very assiduous and busy, that they on a sudden cease from their work; not a single bee stirs out: and those that are abroad hurry home in such prodigious crowds, that the doors of their habitations are too small to admit them. On such occasions, if we look up to the sky, we shall soon discover some of those black clouds which denote impending rain. So correct is their instinct, that it exceeds the sagacity of the philosopher.

When a hive of bees is become too much crowded by the addition of the young brood, a part of the bees think of finding themselves a more commodious habitation, and with that view single out the most forward of the young queens. A new swarm is therefore constantly composed of one queen at least, and of several thousand working bees, as well as some hundreds of drones. The working bees are some old, some young. Scarcely has the colony arrived at its new habitation, when the working bees labour with the utmost diligence to procure materials for food and building. They make more wax during the first fortnight, if the season is favourable, than they do all the rest of the year. Other bees are at the same time busy in stopping all the holes and crevices they find in the new hive, in order to guard against the entrance of insects which covet their honey, their wax, or themselves, and also to exclude the cold air: for it is indispensably necessary that they be lodged warm. When the bees first settle in swarming, indeed when they at any time rest themselves, there is something very particular in the method of taking their repose. It is done by collecting themselves in a heap, and hanging to each other by their feet.

When a swarm divides into two or more bands, which settle separately, this division is a sure sign that there are two or more queens among them. One of these clusters is generally larger than the other. The bees of the smaller cluster or clusters detach themselves by

little and little, till at last the whole, together with the queen, unite with the larger cluster. As soon as the bees are settled, the supernumerary queen or queens must be sacrificed to the peace and tranquillity of the hive. This execution generally raises a considerable commotion in the hive; and several other bees, as well as the queen, lose their lives. Their bodies may be observed on the ground near the hive. The queen that is chosen is of a more reddish colour than those which are destroyed: so that fruitfulness seems to be a great motive of preference in bees; for the nearer they are to the time of laying their eggs, the bigger, redder, and more shining are their bodies.

The balls which we see attached to the legs of bees returning to their hives, are not wax, but a powder collected from the stamina of flowers, not yet brought to the state of wax. The substance of these balls, heated in any vessel, does not melt as wax would, but becomes dry, and hardens: it may even be reduced to a coal. If thrown into water it will sink, whereas wax swims. To reduce this crude substance into wax, it must first be digested in the body of the bee. Every bee when it leaves the hive to collect this precious store, enters into the cup of the flower, particularly such as seem charged with the greatest quantities of this yellow farina. As the animal's body is covered over with hair, it rolls itself within the flower, and quickly becomes quite covered with the dust, which it soon after brushes off with its two hind legs, and kneads into two little balls. In the thighs of the hinder legs there are two cavities, edged with hair; and into these, as into a basket, the animal sticks its pellets. Thus employed, the bee flits from flower to flower, increasing its store, and adding to its stock of wax until the ball upon each thigh becomes as big as a grain of pepper: by this, time, having got a sufficient load, it returns, making the best of its way to the hive. After the bees have brought home this crude substance, they eat it by degrees; or at other times, three or four bees come and ease the loaded bee, by eating each of them a share, the loaded bee giving them a hint so to do. Hunger, however, is not the motive of their thus eating the balls of waxy mat-

ter, especially when a swarm is first hived; but it is their desire to provide a speedy supply of real wax for making the combs. At other times, when there is no immediate want of wax, the bees lay this matter up in repositories, to keep it in store; and it is then known by the name of bee-bread.

It is agreed by the most judicious observers, that the *apiary*, or place where bees are kept, should face the south, and be situated in a place neither too hot nor too much exposed to the cold; that it be near the mansion-house, on account of the convenience of watching them, but so situated as not to be exposed to noisome smells, or to the din of men or cattle; that it be surrounded with a wall, which, however, should not rise above three feet high; that, if possible, a running stream be near them; or if that cannot be, that water be brought near them in troughs; as they cannot produce either combs, honey, or food for their maggots, without water, and that the garden in which the apiary stands be well furnished with such plants as afford the bees plenty of good pasture. Furze, broom, mustard, clover, heath, &c. have been found excellent for this purpose.

"Any person (says Mr. Bonner) who intends to erect an apiary, must take particular care to have it filled with proper inhabitants. He must be peculiarly attentive to this, as all his future profit and pleasure, or loss and vexation, will in general depend upon it. He must therefore pay the utmost attention to the choice of his stock hives, for the man who takes care to keep good stock hives will soon gain considerably by them; but he who keeps bad ones will, besides a great deal of trouble, and little or no success, soon become a broken bee-master. In September every stock hive ought to contain as much honey as will supply the bees with food till June following; and as many bees as will preserve heat in the hive, and thereby resist the severity of a cold winter, and act as so many valiant soldiers to defend the community from the invasions of foreign enemies in spring. They should be full of combs, and well stored with bees and honey, and should weigh at least thirty pounds each; if heavier, so much the better; for light hives run

a great risk of perishing by famine, unless the bees are supplied with food; whereas a well-chosen hive of thirty pounds weight, allowing twelve pounds for the empty hive, bees, combs, &c. will contain eighteen pounds of honey, which will supply the bees with food till June: a time when, it may be presumed, they will find abundance of provisions for themselves among the flowers. When a choice can be obtained, the youngest hive should always be preferred, because old hives are liable to vermin, and other accidents. But although a hive should be four or five years old, it should not be rejected, if it possess these two essential qualities, plenty of bees, and abundance of honey.

Hives have been made of different materials, and in different forms, according to the fancy of people of different ages and countries. Not only straw, which experience now proves to be rather preferable to every thing else, but wood, horn, glass, &c. have been used for the construction of them. Single box-hives, however, when properly made, answer very well, and when painted last long. They have several advantages above straw hives; they are quite cleanly, and always stand upright; they are proof against mice, and are cheaper in the end than straw hives, for one box will last as long as three of them. They are, however, rather colder in winter, but a proper covering will prevent all danger from that quarter. Straw hives are easiest obtained at first, and have been used and recommended by the best of bee-masters. If the swarm be early and large, it will require a large hive; but if otherwise, the hive should be proportionably less. If the bees appear to want more room, it can easily be enlarged by putting a roll or two below it; but if it be heavy enough for a stock hive, it will do although it should not be quite full of combs.

Bees first swarm in May, or in the end of April, but earlier or later according to the warmth of the season. They seldom swarm before ten in the morning, and seldom later than three in the afternoon. We may know when they are about to swarm, by clusters of them hanging on the outside of the hive. But the most certain sign is, when the bees refrain from going into the fields,

though the season be inviting. Just before they take flight there is an uncommon silence in the hive; after this, as soon as one takes flight, they all follow. Before the subsequent swarmings there is a great noise in the hive, which is supposed to be occasioned by a contest, whether the young or the old queen should go out. When the bees of a swarm fly too high, they will descend lower, upon throwing handfuls of sand or dust among them, which they probably mistake for rain. For the same purpose it is usual to beat on a kettle or frying-pan: this practice may have taken its rise from observing that thunder, or any great noise, prompts bees in the fields to return home. As soon as the swarm is settled, the bees which compose it should be got into a hive, with all convenient speed, to prevent their taking wing again. If they settle on the small branch of a tree, easy to come at, it may be cut off and laid upon a cloth, the hive being ready immediately to put over them. If the branch cannot be conveniently cut, the bees may be swept from off it into the hive. Lodge but the queen in the hive and the rest will soon follow. If the bees must be considerably disturbed in order to get them into a hive, the most advisable way is to let them remain in the place where they have pitched till the evening, when there is less danger of their taking wing. If it be observed that they still hover about the tree they first lighted upon, the branches may be rubbed with rue, elder leaves, or any other thing distasteful to them, to prevent their returning to it.

The hive employed on this occasion should be cleansed with the utmost care, and its inside rubbed with fragrant herbs and flowers, the smell of which is agreeable to the bees, or with honey. The hive should not be immediately set on the stool where it is to remain, but kept near the place at which the bees settled till the evening, lest some stragglers should be lost. It should be shaded either with boughs or with cloth, that the too great heat of the sun may not annoy the bees.

The *habitations of bees* ought to be very close; and what their hives want from the negligence or unskilfulness of man, these animals supply by their own industry. For this purpose they make

use of a resinous gum, which is more tenacious than wax, and differs greatly from it. This the ancients call *propolis*. It will grow considerably hard in the hive, though it will in some measure soften by heat, and is often found different in consistence, colour, and smell. It has generally an agreeable aromatic odour when it is warmed; and by some it is considered as a most grateful perfume. When the bees begin to work with it, it is soft; but it acquires a firmer consistence every day, till at length it assumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and some think it is met with on the birch, the willow, and poplar.

Bees anxiously provide against the entrance of insects into the hive, by glueing up with wax or propolis the smallest holes in it. Some stand as sentinels at the mouth of the hive, to prevent insects of any kind from getting in. But if a snail or other large insect should get in notwithstanding all resistance, they sting it to death, and then cover it over with a coat of propolis, to prevent the bad smell or maggots which might proceed from the putrefaction of such a large animal.

When a swarm is too few in number for a hive, another may be added or united to it. The usual method of thus uniting swarms is very easy: spread a cloth at night upon the ground, close to the hive in which the two casts or swarms are to be united, lay a piece of stick across the cloth, then fetch the hive with the new swarm, set it over the stick, give a smart stroke on the top of the hive, and all the bees will drop down in a cluster. This done, throw aside the empty hive, take the other from off the stool, and set this last over the bees, who will soon ascend into it, mix with those already there, and become one and the same family.

A large swarm may weigh eight pounds, and so gradually less to one pound; consequently, a very good one may weigh five or six pounds. All such as weigh less than four pounds, should be strengthened by uniting to them a less numerous swarm. The size of the hive should be proportioned to the number of bees; and as a general rule, it should be rather under than

over-sized, because bees require to be kept warmer than a large hive will admit.

Providence has ordained that insects which feed on leaves, flowers, and green succulent plants, are in an insensible or torpid state, from the time that the winter's cold has deprived them of the means of subsistence. Thus the bees during the winter are in so lethargic a state that little food supports them; but as the weather is very changeable, and every warm or sunny day revives them, and prompts them to return to exercise, food becomes necessary on these occasions.

Many hives of bees which are thought to die of cold in winter, in truth die of famine, when a rainy summer has hindered the bees from laying in a sufficient store of provisions. The hives should therefore be carefully examined in autumn, and should then weigh at least eighteen pounds. The common practice is, to feed them in autumn, giving them as much honey as will bring the whole weight of the hive to near twenty pounds. The easiest and most rational method is, to set under the hive a plate of liquid honey, with a paper pierced full of holes, through which the bees will suck the honey without daubing themselves. In case honey cannot be procured, a mixture of brown sugar, wetted with strong beer, will answer every purpose. Another circumstance which may render it very necessary to feed the bees is, when several days of bad weather ensue immediately after they have swarmed; for then, being destitute of every supply beyond what they carried with them, they may be in great danger of starving. In this case, honey should be given them in proportion to the duration of the bad weather.

In this country it is usual, in seizing the honey and wax from bees, to rob them also of their lives. The common method is, that when those which are doomed for slaughter have been marked out, (which is generally done in September), a hole is dug near the hive, and a stick, at the end of which is a rag dipped in melted brimstone, being stuck in that hole, the rag is set on fire, the hive is immediately set over it, and the earth is instantly thrown up all around, so that none of the smoke can escape. In a quarter of an hour, all the bees are

seemingly dead, and they are rendered soon after irrecoverably so, by being buried in the earth that is returned back into the hole. By this last means it is that they are absolutely killed; for it has been found by experiment, that all the bees which have been affected only by the fume of the brimstone, recover again, excepting such as have been singed or hurt by the flame. Hence it is evident that the fume of brimstone might be used for intoxicating the bees, with some few precautions. The heaviest and the lightest hives are alike treated in this manner; the former, because they yield the most profit, with an immediate return; and the latter, because they would not be able to survive the winter. Those hives which weigh from fifteen to twenty pounds are thought to be the fittest for keeping.

Mr. Wheler, in *his Journey into Greece*, (p. 411) tells us, that at Mount Hymethus they have a method of saving the bees, which is as follows: The hives they keep the bees in are made of willows or osiers, fashioned like our common dust baskets, wide at top and narrow at the bottom, and plastered over with clay. They are set with the wide end uppermost. The tops are covered with broad flat sticks, which are also plastered over with clay; and, to secure them from the weather, they cover them with a tuft of straw, as we do. Along each side of these sticks the bees fasten their combs; so that a comb may be taken out whole, without the least bruising, and with the greatest ease imaginable. To increase them in spring, that is, in March or April, until the beginning of May, they divide them; first separating the sticks on which the combs and bees are fastened, from one another, with a knife; so, taking out the first comb and bees together on each side, they put them into another basket, in the same order as they were taken out, until they have equally divided them. After this, when they are both again accommodated with sticks and plaster, they set the new basket in the place of the old one, and the old one in some new place. All this they do in the middle of the day, at such time as the greatest part of the bees are abroad; who at their coming home, without much difficulty, by this means divide themselves equally. This device hinders them from swarming and

fly away. In August they take out their honey; which they do in the day-time also, while they are abroad; the bees being thereby, they say, disturbed least: at which time they take out the combs laden with honey, as before; that is, beginning at each outside, and so taking away, until they have left only such a quantity of combs in the middle, as they judge will be sufficient to maintain the bees in winter; sweeping those bees that are on the combs into the basket again, and then covering it with new sticks and plaister.

Various methods have also been adopted in England, to attain the desirable end of getting the honey and wax without destroying the bees; the most approved of which is Mr. Thorley's, who in his Inquiry into the Nature, Order, and Government of Bees, thinks colonies preferable to hives. He tells us, that he has in some summers taken two boxes filled with honey from one colony, and yet sufficient store has been left for their maintenance during the winter, each box weighing forty pounds. His boxes are made of deal, and an octagon, being nearer to a sphere, is better than a square form; for as the bees, in winter, lie in a round body near the centre of the hive, a due heat is then conveyed to all the out parts. The dimensions which Mr. Thorley, after many years experience, recommends for the boxes, are ten inches in depth, and twelve or fourteen inches in breadth in the inside. The best and purest honey is that which is gathered in the first five or six weeks: and in boxes of less dimensions, we may take within a month, provided the season be favourable, a box-full of the finest honey. The top of the box should be made of an entire board, a full inch thick after it has been planed: and it should project on all sides, at least an inch beyond the dimensions of the box. In the middle of this top there must be a hole five inches square, for a communication between the boxes; this hole should be covered with a sliding shutter, of deal or elm, running easily in a groove over the back window. The eight pannels, nine inches deep and three quarters of an inch thick when planed, are to be let into the top so far as to keep them in their proper places; to be secured at the corners with plates of brass, and to be cramped with wires at the bottom to keep them firm; for the

heat in summer will try their strength. There should be a glass window behind, fixed in a frame with a thin deal cover, two small brass hinges, and a button to fasten it. This window will be sufficient for inspecting the progress of the bees. Two brass handles, one on each side, are necessary to lift up the box; these should be fixed in with two thin plates of iron, near three inches long, so as to turn up and down, and put three inches below the top board, which is nailed close down with sprigs to the other parts of the box. Those who choose a frame within, to which the bees may fasten their combs, need only use a couple of deal sticks of an inch square, placed across the box. One thing more which perfects the work, is a passage four or five inches long, and less than half an inch deep, for the bees to go in and out at the bottom of the box. In keeping bees in colonies, a house is necessary, or at least a shade; without which the weather, especially the heat of the sun, would soon rend the boxes to pieces. The house may be made of any boards, but deal is the best; and it must be painted, to secure it from the weather. The length of it for six colonies, should be full twelve and a half feet, and each colony should stand a foot distant from the other. It should be three and a half feet high, to admit four boxes one upon another; but if only three boxes are employed, two feet eight inches will be sufficient. Its breadth in the inside should be two feet.

The best time to plant the colonies is, either in spring with new stocks full of bees, or in summer with swarms. If swarms are used, procure if possible two of the same day: hive them either in two boxes, or in a hive and a box: at night, place them in the bee-house, one over the other; and with a knife and a little lime and hair, stop close the mouth of the hive or upper box, so that not a bee may be able to go in or out but at the front door. Within a week or ten days the combs will appear in the boxes; but if it be an hive, nothing can be seen till the bees have wrought down into the box. Never plant a colony with a single swarm. When the second box, or the box under the hive, appears full of bees and combs, it is time to raise the colony. This should be done in the dusk of the evening, and in the follow

ing manner. Place the empty box, with the sliding shutter drawn back, behind the house, near the colony that is to be raised, and at nearly the height of the floor: then lifting up the colony as quickly as possible, let the empty box be put in the place where it is to stand, and the colony upon it; and shut up the mouth of the then upper box with lime and hair, as directed before. When upon looking through the windows in the back of the boxes, the middle box appears full of combs, and a quantity of honey sealed up in it, the lowest box half full of combs, and few bees in the uppermost box, proceed thus:—About five o'clock p.m. drive close with a mallet the sliding shutter under the hive or box that is to be taken from the colony. If the combs are new, the shutter may be forced home without a mallet; but be sure it is close, that no bees may ascend into the hive or box to be removed. After this shut close the doors of the house, and leave the bees thus cut off from the rest of their companions, for half an hour or more. In this space, having lost their queen, they will fill themselves with honey, and be impatient to be set at liberty. If, in this interval, upon examining the box or boxes beneath, all appears to be quiet in them, it is a sign that the queen is there and in safety. Hereupon, raise the back part of the hive or box so far, by a piece of wood shipped under it, as to give the prisoners room to come out, and they will return to their fellows: then lifting the box from off the colony, and turning its bottom upmost, cover it with a cloth all night; and the next morning when this cloth is removed, the bees that have remained in it will return to the colony. Thus a box of honey is procured, and all the bees are preserved. If the bees do not all come out in this manner, Dr. Warder's method may be followed, especially if it be with a hive: viz. to place the hive with the small end downward in a pail, peck, or flower-pot, so as to make it stand firm; then to take an empty hive, and set it upon the former, and to draw a cloth tight round the joining of the two hives, so that none of the bees may get out: after this, to strike the full hive so smartly as to disturb the bees that are in it, but with such pauses between the

strokes as to allow them time to ascend into the empty hive; which must be held fast whilst this is doing, lest it fall off by the shaking of the other. When by the noise of the bees in the upper hive, it is perceived that they are got into this last, carry it to a cloth spread for this purpose before the colony, with one end fastened to the landing-place, and knock them out upon it: they will soon crawl up the cloth, and join their fellows, who will gladly receive them.

Mr. Thorley's method of preserving bees in common hives, is incorporation or uniting two stocks into one, by the help of a peculiar fume or opiate, which will put them entirely in the bee-master's power for a time to divide and dispose of at pleasure. But as that dominion over them will be of short duration, he must be expeditious in this business. The queen is immediately to be searched for, and killed. Hives which have swarmed twice, and are consequently reduced in their numbers, are the fittest to be joined together, as this will greatly strengthen and improve them. If a hive is both rich in honey and full of bees, it is but dividing the bees into two parts, and putting them into two boxes instead of one. Examine whether the stock, to which the bees of another are to be joined, have honey enough to maintain the bees of both: it should weigh full twenty pounds. The narcotic, or stupifying fume, is made with the fungus maximus or pulverulentus, the large mushroom, commonly known by the name of bunt, puck-fist, or frog-cheese. It is as big as a man's head, or bigger when ripe; it is of a brown colour, turns to powder, and is exceedingly light. Put one of these pucks into a large paper, press it to two-thirds or near half the bulk of its former size, and tie it up very close; then put it into an oven some time after the household bread has been drawn, and let it remain there all night; when it is dry enough to hold fire, it is fit for use. The manner of using it is this: cut off a piece of the puck, as large as a hen's egg, and fix it in the end of a small stick slit for that purpose, and sharpened at the other end; which place so that the puck may hang near the middle of an empty hive. This hive must be set with the mouth upward, in a pail or bucket which should

hold it steady, near the stock intended to be taken. This done, set fire to the puck, and immediately place the stock of bees over it, tying a cloth round the hives, that no smoke may come forth. In a minute or little more, the bees will be heard falling like drops of hail into the empty hive. Then beat the top of the full hive gently, to get out as many of them as possible: after this, loosening the cloth, lift the hive off to a table, knock it several times against the table, several more bees will tumble out, and perhaps the queen among them. She often is one of the last that falls. If she is not there, search for her among the main body in the empty hive, spreading them for this purpose on a table. Proceed in the same manner with the other hive, with the bees of which these are to be united. One of the queens being secured, put the best of both hives together, mingle them thoroughly, and drop them among the combs of the hive which they are intended to inhabit. Then cover it with a coarse cloth which will admit air, and let them remain shut up all that night and the next day. It will easily be known when they are awaked from this sleep. The second night after their union, in the dusk of the evening, gently remove the cloth from off the mouth of the hive, and the bees will immediately sally forth with a great noise; but being too late, they will soon return; then inserting two pieces of tobacco-pipe to let in air, keep them confined for three or four days, after which the door may be left open. The best time for uniting bees is after their young brood are all out, and before they begin to lodge in the empty cells. As to the hour of the day, Mr. Thorley advises young practitioners to do it early in the afternoon, in order that having the longer light, they may the more easily find out the queen. He never knew such combined stocks conquered by robbers. They will either swarm in the next summer, or yield an hiveful of honey.

Boxes placed laterally will answer every purpose of these of Mr. Thorley, and they may be made square and in the simplest manner.

Bees have various enemies; mice should be guarded against, by diminishing the entrance into the hives when the cold comes on, and the bees are less able to defend themselves; and

the hives may be placed in such a manner, that it will be impossible for the mice to reach them. Spiders and caterpillars are very destructive to bees; a species of the latter, called the wax-worm, or wax-moth, because it feeds on wax, lays its eggs in the hive, which turn to maggots, that are very noisome and prejudicial. Hives of bees that have swarmed more than once, and such as contained little honey, are most exposed to these insects; for the empty combs serve them for shelter, and the wax supplies them with food. These hives should be cleaned at least once a week; and the stools on which they rest, where the moths are laid by the bees, should be cleaned every morning. But they cannot be entirely destroyed, without taking away the infected hive, removing the bees, and cleansing it of the moths, before it is restored to its former occupiers. Bees are often troubled with lice, which may be destroyed by strewing tobacco over them. The depredations of birds, and particularly of the house-lark and swallow, should be carefully prevented. Ants, woodlice, and ear-wigs, are also enumerated among the enemies of the bees. Mr. King says, "The earwigs steal into the hives at night, and drag out bee after bee, sucking out their vitals, and leaving nothing but their skins or scalps like so many trophies of their butchery." Wasps and hornets are, however, the most formidable enemies that bees have to encounter.

Wasps are very destructive to bees, on account of their superior strength and prodigious numbers, especially in a year favourable to their breeding. They are most numerous in July and August. Soon after that the workers die; but the mothers survive the winter, and commence breeding about April. If cold and wet weather ensues, the greater part of the brood are starved, because the workers cannot fly out for forage, and wasps never lay up any store. Wet is very injurious to their nests, and therefore, in a long season of heavy rain, few wasps will appear till September; but a mild winter, succeeded by a hot spring, will so favour the increase of wasps, that without the greatest vigilance many stocks will fall victims to their power.

One wasp is a match for three bees. They are very bold, and frequently en-

counter the most imminent danger, undauntedly opposing a host of bees, to obtain a belly-full of honey. Therefore, when cold weather commences, knowing that the bees keep no guard then, great numbers get quietly in, and carry off abundance of honey; and having once tasted of the sweets, they will not desist till they possess the whole. Perhaps the same method of destroying them, in this case, as directed for bee-robbers, would prove as effectual against wasps.

In the spring the mother wasps may be seen about old timber, with the splints of which they compose their nests. On the blossoms of gooseberries and raspberries they will be found often, and may easily be knocked down and destroyed. Their death, at that time, will prevent a like number of nests from existing the next summer. A nest of wasps is said to consist of thirty thousand. Effectually to destroy a nest, in the evening, when the wasps have done labour, repair to the place, and stop all the holes of their egress or regress. Introduce a squib into the chief passage, and instantly stopping it with a sod, &c. they will presently be suffocated. Dig the nest up, and burn it. Perhaps a wild-fire of damp gunpowder placed on a piece of wood, and introduced, would answer the same purpose.

Hornets, in the spring, will watch the bees as they issue from the hives. When they are seen about the hives, they should be knocked down and trod upon. They may be trepanned, by placing an empty hive, with its inside smeared with honey among the stocks. Allured by this the mother hornets will begin to build in it. In the evening lift up the hive, which may be done with safety, if the mother is there; then set it down again, and in half an hour after have a vessel with water ready; take the hive and plunge it a little into the water, then strike smartly on the top of the hive, and the hornets will fall into the water, and by a pair of tongs may be crushed to death. Or, the hive may be closely stopped up till morning; and then taking it into a room, raise the edge next the window; the hornet will fly directly to it, and may readily be destroyed. Their nests are usually hung on the rafters, beams,

or out-houses, or fixed in hollow trees. They resemble a globe of brownish paper.

The nest may be taken by preparing a large mouthed bag, with a running string to draw the mouth close. On a rainy day, or in an evening, put on the bee-dress, and with great stillness approach the nest, and draw the bag gently over it, instantly pulling the mouth so close that not a hornet may escape.

"Much has been said about the cruelty of killing bees," says Mr. Leaden, "but if man is entitled to deprive them either totally or partially of their food, he has an equal right of depriving them of their lives. For, of the hives that have been partially or wholly deprived of their honey, it may be safely affirmed, that there is not one in ten that does any good. If they live till the succeeding spring, they are commonly too weak to collect food or to breed, and, being plundered by their neighbours, dwindle away, till at last the hive is without inhabitants. A prompt death is surely preferable to one so protracted."

BEER, (a fermented liquor, made from any farinaceous grain; but generally from malted barley).—This is effected by extraction with water and fermentation. With this view, a quantity of malt freed from the germ, and sufficient for one brewing, is coarsely bruised by grinding, and being placed in the mash tub, after being well mixed with tepid water, the temperature is considerably raised. When the whole mass has been well stirred, and then allowed to subside, the extract, (or sweet wort) is brought into the boiler, and the malt remaining in the tub is once more extracted by infusion with hot water. This second extract, treated in like manner, is added to the first, and both are boiled together. This clear infusion is now drawn off, and called boiled wort. To render the beer fitter for digestion, as well as to fit it for the market, hops are added. After which it ought to be quickly cooled, to prevent its transition to the acetous fermentation, which would ensue if it were kept too long at a high temperature. On this account, the wort is transferred into the cooler, where it is exposed with a large surface to cold air, and from this to the fer-

menting tub, that, by the addition of a sufficient portion of recent yeast, it may begin to ferment.

When this fermentation has proceeded to a due degree, and the yeast ceases to rise, the beer is conveyed into casks, placed in cool cellars, and the fermentation completed. It now becomes what is called "*barrelled beer*," with the precaution of occasionally filling up the vacancy caused in the vessel by evaporation.

Beer well prepared, should be limpid and clear, possess a due quantity of spirit, excite no disagreeable sweet taste, and contain no disengaged acid. "*Brown beer*" derives its colour from malt highly dried in the kiln, and its bitterish taste from the hops. "*Pale beer*" is brewed from malt still lower dried.

Beer is a species of venous beverage, distinguished from wine, and other liquors of that kind, by the much greater quantity of mucilaginous matter which it has received by extraction.

Bottled beer is beer bottled before it has done fermenting; and the bottles are stopped a little before the fermentation is completely over. By so doing, the bottled beer is rendered sparkling. In this state it frequently bursts the bottles, by the disengagement of the carbonic acid gas which it contains; and it effervesces like champagne, when brought into contact with air, on being poured into a glass.

BEGONIA (named in honour of M. Begon, a Frenchman, born in 1633; he was an intendant of marine; and a promoter of botany).

Class Monœcia Polyandria. Nat. Ord. *Begoniaceæ*.

The Characters are—**MALE.** *Calyx 0; petals 4, the two opposite the largest; stamens numerous.* **FEMALE.** *Calyx 0; petals 4-6, like the male; styles 3, bifid; capsule inferior, three angular, winged, three celled, many seeded.*

1. **BEGONIA NITIDA** (shining-leaved Begonia). Par. lond. t. 72. *Leaves very smooth, unequally cordate, obsolete toothed; wings of capsule very large, roundish.*—The whole plant is smooth. Stems almost upright, branched. Branches alternate, cylindrical. Leaves seven-nerved, one lobe of the base is double the size of the other. The younger leaves are rose-coloured about the edge; they are all very

smooth and shining, of a bright green above, paler beneath. They are five inches long, and three broad. Racemes compound, the males very numerous, the females few at the top, solitary, axillary, caducous. Corolla, flesh or rose-coloured; sometimes of a darker red: in the female flowers, six-petalled.

This elegant shrub, which is now a common ornament to our hot-houses, was introduced here in the year 1777, by William Brown, M.D. It is a native of Jamaica, and flowers here from May to December.

2. **BEGONIA DICHOTOMA** (forked Begonia). *Shrubby, erect; leaves unequally cordate, subangular, tooth-letted, smooth, hairy beneath at the veins; panicle dichotomous.*—An ornamental species, native of the Caraccas. The stem rises two feet in height. Flowers white. They appear from July to September. It may be increased by cuttings, planted in sandy loam. Introduced 1800.

3. **BEGONIA ACUTIFOLIA** (acute leaved Begonia). Sloan. j. t. 127. f. 1, 2. *Leaves acute.*—This plant has very small, brown, fibrous roots; by which it creepeth along the surface of the ground, sending up a round, red, and jointed stalk, about a foot and a half high. The leaves are three inches long, half as broad, rough, and of a yellowish green colour. The flowers are white, with yellow stamina. It comes very near to the *acuminata*, but differs in having few or no hairs on the leaves, which are on longer footstalks one-third or one-fourth of the length of the leaf itself; these on the contrary are so short in *B. acuminata*, as not to equal the angle of the leaf, which extends beyond the insertion of the footstalk. According to Jacquin, the stems creep, and as they run along, put out both roots, and upright branches a foot and a half in height.

Native of Jamaica, on the blue mountains; where it was observed by Sir Hans Sloane, and since by Masson. Sloane's description does not accord either with his figure or specimens. Introduced 1790.

4. **BEGONIA RENIFORMIS** (kidney leaved Begonia). Lin. t. vol. 1. t. 14. f. 1, 2. *Leaves crenate-toothed, cordate at the base, one side smaller than the other.*—The stems are short, the thickness of a finger. Leaves broader than

a span in length, terminated by a twice dichotomous cyme, splitting into four-fold divisions. Pedicels umbelled. In the *male flowers*, petals four cross-shaped, spreading white: two opposite larger, ovate, quite entire, in the middle convex outwardly, the others only half the size, oblong-lanceolate, acute, slightly keeled. Filaments about thirty, nearly equal, yellow. Anthers linear-oblong, longer than the filaments, the length of the smaller petals, upright, yellow. No pistil. In the *female flowers* five petals oblong, nearly equal, spreading, a little concave, sharpish, white. Styles 3, two-parted, somewhat villous: stigmas simple. Capsule ovate, with the two inner angles equal and smaller than the third, which is very large and extends upwards into an acute angle; it is three-celled, and the cells are cylindric, gaping at the base. Seeds very numerous, ovate, small, fastened to a thick columnar receptacle.

Native of Brazil, near Rio Janeiro, in shady clefts of rocks. Observed there by Sir Joseph Banks. Flowering in July and August. Introduced 1823.

5. *BEGONIA SPATULATA* (spatulate Begonia). *Leaves blunt, obsoletely tooth-letted, smoothish; stipules spatulate, unequal, ciliated; wings of capsule blunt.*—The stem is succulent and heavy, sometimes requiring support; if cut down occasionally it will greatly improve its growth and form. It blossoms most abundantly, being very seldom out of bloom the whole year. It requires the heat of the stove during winter, but may be exposed to the open air for a considerable time in summer. It is very readily increased by cuttings, in a loamy soil; they should not be over-watered during the winter. Native of the West Indies. Introduced 1819.

6. *BEGONIA UNDULATA* (wave leaved Begonia). Bot. mag. t. 2723. *Leaves waved, entire, glabrous, shining, unequally cordate.*—This species is a native of Brazil. The stem is erect, when young green, and having numerous small oblong white spots; when older, glabrous and of a reddish grey colour. The leaves are three inches long, of a full green on the upper surface, paler and minutely dotted below; the edges

Stamens numerous, yellow. The seeds, which are very numerous, cover the projecting wings of their green receptacles. Introduced 1825.

7. *BEGONIA HOOKERI* (Hooker's Begonia). Bot. mag. t. 2920. *Leaves alternate, remote, unequal, apiculate, the margins minutely serrated; petiole long, channelled; stipules ovate, oblong, deciduous.* A native of Brazil. The leaves are of a pale green colour, with the surface particularly smooth and free from hairiness. The stem is erect, scarcely ever branched, and of a reddish green. The male and female flowers are large, with rose-coloured petals. Capsule greenish brown, with three very unequal wings, the largest forming a triangular, very projecting and obtuse membrane. Flowers in October. Introduced 1827.

8. *BEGONIA INSIGNIS* (handsome flowered Begonia). Bot. mag. t. 2900. *Leaves alternate, on smooth, shining petioles, half the size of the leaves, unequally cordate, acuminate.*—In foliage it is not equal to *B. argyrystigma*, nor the appearance of its stem to *B. dipetala*, but it surpasses these and perhaps every other cultivated species in the gracefully drooping clusters of its large, bright rose-coloured flowers. It adds greatly to its value, that it flowers most freely in the stove during the month of December. Native of Brazil. Introduced 1828.

9. *BEGONIA SEMPERFLORENS* (free flowering Begonia). Bot. cab. t. 1438. *Leaves alternate, ovate, rotundate, a little cordate, unequal.*—This is a very pretty plant, a native of the Brazils. The flowers are white. Stamens numerous, and of a yellow colour. It requires the stove, and is a desirable article for it, as it continues almost constantly in bloom. It is propagated without difficulty by cuttings, and should be potted in light loam. Introduced 1829.

10. *BEGONIA EVANSIANA* (Evan's Begonia). Bot. mag. t. 1473. *Leaves angular, serrulate crimson beneath; stem nodose; wings of capsule unequal, rounded.*—A highly ornamental stove plant. The stem is three feet high. The younger leaves have the veins only of a bright green. In the older leaves

the under side is entirely of a bright red. Flowers most parts of summer. It is easily propagated by cuttings, or by bulbs, which are frequently produced at the division of the stems. It is a native of China, where it is called Tsou Hoy Toug. Introduced 1804.

11. *BEGONIA PICTA* (painted Begonia). Sm. ex. bot. t. 101. *Stemless; leaves ovate, cordate, hirsute, finely serrulated; capsules hairy.*—This elegant plant was discovered by Dr. Buchanan growing among mosses, upon rocks, in Upper Nepal. The root is perennial, tuberous. Stem herbaceous, an inch or two in length, throwing out fibrous roots at its joints. Leaves few, (on long round footstalks) very rugged, blotched with various colours, most purple beneath. Flowers drooping, rose-coloured, male and female in the same panicle. The whole herb is rough with little bristly hairs. All the leaves have an acid taste, and are used in the East as food. Flowers in September. Introduced 1818.

12. *BEGONIA DIVERSIFOLIA* (various leaved Begonia). Bot. mag. t. 2966. *Stem leaves alternate, half-cordate, acuminate, somewhat lobed, acutely and unequally serrated; root leaves kidney shaped.*—This species is a native of Mexico. The stem is twining, herbaceous, branched, and transparent. The leaves bright green above, paler and somewhat glaucous beneath, with the nerves branched and prominent behind. The flowers are rose-coloured.

The whole plant is smooth and shining, and makes a very handsome appearance, from the numerous clusters of flower buds. They appear in October. Introduced 1828.

13. *BEGONIA PAUCIFLORA* (few-flowered Begonia). Bot. reg. t. 471. *The leaves nearly equally cordate, very blunt, crenate, downy; upper cucullate; stipules lanceolate, scarious.*—This species is caulescent, fleshy, three feet high, with round, branched, reddish stems. Leaves nearly vertical, minutely furred, of a lively green above, paler beneath; petioles of the colour of the stem. Panicles few-flowered, hairy. Barren flowers pale, tinged with red; fertile one pale green; wings of the germen obtuse, one larger than the rest. It makes a very handsome appearance, and is deserving of a place in every collection. Flowers in

June. Native of the West Indies. Introduced 1816.

14. *BEGONIA ACUMINATA* (pointed leaved Begonia). Bot. reg. t. 364. *Caulescent; leaves hispid, half cordate, acuminate, unequally toothed; largest wing of capsule obtuse, angular.*—In this species the male flowers have four petals, of which two that are opposite are smaller. The female flowers have five petals, of which two also are smaller than the rest. At the base of the germ are two bractes, which are sharply serrate, and only half the length of the germ. Native of Jamaica. Requires to be kept in the hot-house, where it flowers during the winter months. Introduced 1790.

15. *BEGONIA TUBEROSA* (tuberous Begonia). *Creeping; leaves unequally cordate, angular, toothed; wings of capsule parallel.*—The stems are round, creeping. Leaves pale red, white or pale green, smooth and somewhat shining. Petals two, red on the outside, white within, in the male flowers; four in the female flowers, and white. Native of Amboyna. Flowering from July to September. Introduced 1810.

16. *BEGONIA ARGYROSTIGMA* (silver spotted Begonia). Bot. reg. t. 666. *Leaves half cordate, acuminate, with a somewhat cartilaginous, slightly crenulated, repand margin.*—The stem is upright, branched, straggling, two to three feet high, very smooth, with brown sheathing circles above the petioles. The leaves are five to six inches long, two broad, very smooth, fleshy, at the upper surface marked with white roundish spots of various sizes, produced by the disappearance of the green pigment in the cellular tissue; at the under surface wholly red.

These spots suggested to Dr. Fischer the unwieldy specific name, a mark however, which is not confined to this species. Native of Brazil. Flowering from July to September. Introduced 1819.

17. *BEGONIA DIPETALA* (two petalled Begonia). Bot. mag. t. 2846. *Leaves half-heart shaped, acute and somewhat lobed, unequally and doubly serrate dentate; petioles distichous rounded, slightly channelled.*—This species (which like all the other species of Begonia, requires the heat of the stove), makes a very handsome appearance. The stem is erect, greyish brown, with a few

The flowers are large, those of the female an inch broad, by three quarters of an inch long, dipetalous, and of a pleasing pink. It is a native of the East Indies. Flowering in April. Introduced 1826.

18. *BEGONIA HUMILIS* (dwarf Begonia). Hook. ex. flor. t. 17. *Caulescent, erect; leaves hispid, doubly serrated, half cordate; wings of capsule rounded, nearly equal.*—This plant is about a foot and a half high, and perennial. Stems much branched, greenish below, reddish above, marked with longitudinal deeper coloured lines. Leaves two to three inches long, bright green, shining, hispid above, glabrous beneath. The flowers white. The germen greenish. Capsule with unequal longitudinal wings, brown. The wings remain attached only by their upper and lower extremities. The capsule itself opening by three longitudinal fissures. A native of the West Indies. Introduced 1788.

19. *BEGONIA PAPILLOSA* (papillose Begonia). Bot. mag. t. 246. *Leaves very unequally cordate, acuminate somewhat undulate, and bullate, crisp-éd; stipules ovate, acuminate.*—A very ornamental species. The stem is erect, eighteen inches or more in height, with few branches. The leaves on the upper surface are of a bright shining green, red and glabrous below. The flowers appear in April. They are of a beautiful rose-colour. The male flowers which are placed always along with the female in the axil of the bifurcations, uniformly expands before the corresponding female flower. Native of Brazil. Introduced 1823.

20. *BEGONIA VILLOSA* (villous Begonia). Bot. reg. t. 1252. *Leaves half cordate, obtuse, obscurely doubly toothed.*—A stove plant from the Brazils. The stem is erect, shaggy towards the top. The flowers are white, very slightly tinged with red. Wings of the capsule rounded, having no angles; one of the wings are much larger than the rest. The flowers appear from August to October. It is readily increased by seeds. Introduced 1827.

21. *BEGONIA SAUVEOLENS* (fragrant Begonia). Bot. cab. t. 69. *Leaves half cordate, opposite.*—This plant is a native of the West Indies. It flowers very

easily cultivated in a loamy soil, and increased by cuttings. It should be kept in the cooler part of the stove, not being very tender, observing in winter to water it but sparingly. Introduced 1816.

22. *BEGONIA HIRSUTA* (shaggy leaved Begonia). Aub. guian. t. 348. *Caulescent; leaves hispid, half cordate, doubly serrated; largest wing of capsule very large, obtuse, angular.*—Stem cylindric, branched. Leaves sharp, streaked with red veins, petioled. Stipules long, toothletted. Flowers panicled, terminating, dichotomous, with two small linear scales at the base of each. Corolla white.

The female flowers, according to Jacquin, are five-petalled. He affirms also, that this sort is annual and dioecious; but that may be a mistake.

Observed by M. Fusée Aublet, on the rocks of Guiana. Flowering in May and June. Introduced 1780.

23. *BEGONIA SCANDENS* (climbing Begonia). Aub. g. t. 348. *Scandent, radicant; the leaves hispid, half cordate; the largest wing of the capsule obtuse ungued, the other parallel and very small; obscurely toothed.*—This differs from the *hirsuta* in having the stems decumbent, knotty, and pushing out roots at the knots; it climbs trees when they are within its reach. Leaves less deeply toothed. Flowers smaller, greenish. Aublet affirms, that this species is dioecious. He also says, that the leaves are smooth, but they are not quite without hairs. This is perennial; and a native of Guiana, the Isle of France and Jamaica. Flowering from July to September. Introduced 1824.

CULTURE.—The species of this genus are remarkable for the neatness of their foliage and their succulent habit. They are natives of Asia and America within the Tropics. Three species have been found on the islands near the Coast of Africa, but none on that continent.

These plants increase readily by cuttings; and if kept in the bark-stove prove highly ornamental, being much esteemed both for the beauty of the flowers and the singularity of the leaves. Where there is no bark-stove, they will be found to do very well over the flue of the dry stove.

The Characters are.—*Calyx* seven-
 cleft; *petals* 7; *stamens* 14; *berry* seren-
 celled, many seeded.

1. *BEJARIA RACEMOSA* (sweet scented
Bejaria). *Leaves* ovate, lanceolate,
 smooth; *flowers* terminal in *panicled*
racemes.—This species is a beautiful
 shrub, from three to four feet high, with
 pink flowers of an agreeable scent. It
 is found upon the banks of swamps and
 ponds, in the southern states of North
 America; flowering in July and August.
 Introduced 1810.

2. *BEJARIA ÆSTUANS*. *Leaves* lanceo-
 late; *flowers* in *racemes*.—This is a
 shrub twelve feet in height, with
 roundish spreading branches. Leaves
 generally alternate, crowded, obtuse,
 quite entire, without veins, shining, to-
 mentose underneath. Petioles very
 short, flattish. Flowers axillary, few;
 terminating many. Peduncles racemed;
 pedicels round, hirsute, the length of
 the flower, not shorter, as in the other
 species. Corollas flesh-colour. It re-
 sembles the *resinosa*, but is of a higher
 growth. Native of Mexico. Found in
 New Grenada, by Mutis.

3. *BEJARIA RESINOSA*. *Leaves* ovate;
flowers heaped.—This is a tree, with
 proliferous branches, and an irregular
 tender subpubescent bark. Leaves
 scattered, subpetioled, smooth, ever-
 green, quite entire, an inch in length.
 Flowers from the ends of the branches,
 on pubescent one-flowered peduncles
 forming racemes not at all prolonged.
 Corolla purple, very resinous or viscid.
 Stamens pubescent near the base.
 Found in New Grenada by Mutis.

These have a peculiar bitter flavour,
 and are allied to the *Rhododendrons*.

The generic name was erroneously
 made *Befaria* by Linneus: he having
 taken the *y* in Mutis's manuscript for an
f, as I learn from the obliging intelli-
 gence of Dr. Smith, who possesses
 Mutis's letters to Linnæus.

CULTURE. The species of this genus
 require the protection of a green-house.
 Cuttings root readily in a mixture of
 loam and peat under a hand-glass in
 heat.

BELLADONNA.

Class Hexandria monogynia. Nat.
 Ord. *Amaryllidææ*.

ated; laminae slightly concave, recurved,
 patent, lanceolate; stigma obscurely
 lobed-trifid; seeds sub-globose.

1. *BELLADONNA PURPURASCENS* (light
 purple *Belladonna* Lily). bot. mag. t.
 783. *Leaves* ligulate; *corolla* nodding;
sepals recurved at end; *tube* scarcely
 any.—The *Belladonna* Lily has the
 edges of the petals waved, and not re-
 versed at the tip. Scape purple, sus-
 taining from five to seven flowers, in
 shape like the common Red Lily, and
 near as large, but of a soft purple colour,
 inclining to white within side toward
 the bottom, and having an agreeable
 scent. It was first brought to England
 about the year 1712, from Portugal,
 where the gardens formerly abounded
 with these flowers; but the *Jacobæa*
Lily has since supplanted this in most
 of their gardens, and the bulbs imported
 thence for this of late years have gene-
 rally proved to be the *Jacobæa* Lily.
 The gardens in Italy have great quan-
 tities of these flowers, especially about
 Florence, where they are commonly
 sold in the markets, under the name of
Narcissus Belladonna. This sort usually
 flowers about the end of September, or
 the beginning of October, in England;
 and, if the roots are strong, the stem will
 rise upwards of two feet high. If the
 season is favourable, or the flowers are
 screened from frosts, violent winds, and
 heavy rains, they will continue in beauty
 a month or longer, and are very orna-
 mental plants to a garden, at a season
 when there is a great scarcity of flowers.
 Native of the West Indies, on shady
 hills by the side of streams.

2. *BELLADONNA PALLIDA* (pale flow-
 ered *Belladonna* Lily). Bot. reg. t. 714.
Spathe, five-flowered; *segments* reflexed;
germen round; *leaves* channelled, smooth.
 —The bulb is egg shaped. The leaves
 do not appear until after the flowers;
 they grow in winter, to the number of
 six or seven. The stem rises from the
 centre of the bulb, a little flexuous, a
 foot in height, of a pale violet colour,
 and covered with a glaucous powder.
 The flowers, five in number, are termi-
 nal, and are of a very pale blush colour,
 deeper towards the edges. This species
 differs from the *Belladonna purpuras-
 cens*, which it most resembles in the paler

colour of its flowers, and also in its being considerably less than that species.

A native of the Cape of Good Hope.

3. *BELLADONNA BLANDA* (charming *Belladonna Lily*). Bot. mag. t. 1450. *Leaves many, double at the base of the sheath*.—The bulb is nearly twice the size of a swan's egg; integuments pale brown, membranous; leaves of a bright apple green colour, not glaucous, attaining their full size towards the end of January, inner ones about three feet high and an inch and a half broad, outer far shorter and two inches broad; scape three feet high, about an inch in diameter towards the base; flowers produced in June and July, about four inches long, white fading to a blush or pale rose colour, but not in streaks. It has no scent. A space of nearly six months intervene between the flowering of this species and the full growth of its foliage. Native of the Cape of Good Hope. Introduced 1754.

4. *BELLADONNA PUDICA* (modest *Belladonna Lily*). *One-flowered; corolla regular, erect, turbinate, conniving; one sepal pushed aside by the stamens*.—An ornamental species, native of the Cape of Good Hope. It rises to the height of six inches, and bears a solitary pink flower, which possesses a very pleasing appearance. It continues from May to July. Introduced 1795.

CULTURE.—Mr. Miller observes, that "the method in which I have cultivated the *Belladonna Lily* for some time past, with great success, is as follows:—I prepared a border close to a wall which had a south-west aspect, of about six feet wide, in the following manner, viz, I removed all the earth to the depth of three feet, then I put some very rotten dung in the bottom, six inches thick, upon which I laid light garden mould, about twenty inches deep; after making this level, I placed the roots at six inches distance every way, and then covered them over with light sandy earth, to the height of the border, whereby the upper part of the roots were five or six inches buried, and in the winter I covered the border all over with rotten tanners' bark, three inches deep, to prevent the frost from penetrating the ground; and when the frost was very severe, I laid some mats or straw over the leaves to protect them from being killed. With this management the roots have greatly increased,

and have constantly flowered every year; some of them have put out two or three stems, which grow near three feet high, and produced many flowers in each umbel, which have made a fine appearance during the month of October. The green leaves come up soon after, and abide all the winter and spring until June, at which time they decay; soon after which the roots should be transplanted, for if they are let stand till July they will have sent forth new fibres: when it will greatly injure the roots if they are disturbed.

If some of these roots are planted in a warm bed close to a south wall, and on a dry soil, they will thrive very well, especially if they are covered in severe frost, and then these roots will flower much stronger than those which are kept in pots, and will multiply faster."

BELLIDIATRUM.

Class Syngenesia polygamia superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle naked; calyx leafy, equal; seeds crowned with a sessile pappus*.

BELLIDIATRUM MICHELII (Micheli's *Bellidiastrum*). Bot. mag. t. 1196.

Stem naked, very simple, one-flowered.—This has a perennial root. The leaves are like those of the common *Daisy*, but longer, and not so broad. The flower grows on a naked stalk near a foot long, and the root seldom sends out more than one stalk. The ray of the flower is white, and very like that of the *Common Daisy*; the disk is yellow.

Root-leaves many, gradually lessening to the petiole, lanceolate or obovate, quite entire or toothed here and there, hirsute, thickish, pale green. Among these arises the scapes, half a foot, or a span in height, slender, hirsute, round, purplish, erect, one-flowered. Calyx smoothish, the length of the disk of the flower; leaflets eighteen to twenty. Florets in the ray quite entire or with two teeth, spreading very much. Germ crowned only with a down, not with scales. Down of the seeds sessile, plumose. Receptacle convex. The seeds of the ray are downy.

Grows naturally on the Swiss, Tyrolese, and Italian Alps; in Austria, Carniola, and Silesia. Haller found it in the Lower Alps with a deep red flower.

Cultivated by Mr. Miller, in 1759. He received it from Verona.

CULTURE. Propagated by parting the roots, for the seeds do not ripen well in England. It must have a shady situation and a moist soil. The flowers do not make a much better appearance than those of the common Daisy, only they stand on much taller stalks.

BELLIS.

Class Syngénésia polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Involucrum hemisphericum, its scales equal: receptacle naked, conical.*

1. **BELLIS SYLVESTRIS** (large Portugal Daisy). Bot. mag. t. 2511. *Scape naked, single-headed; leaves obovate, crenate, three-nerved.*—A tolerable hardy Perennial. The flowers are produced in the spring. The compressed bristly seeds are quite different from the smooth ones of the common Daisy. Native of Portugal and Italy; growing chiefly in woods and under shady hedges. Is propagated by dividing its roots as it seldom perfects its seeds here.

2. **BELLIS PERENNIS** (common Daisy). Eng. bot. t. 424. *Scape naked.* β *B. hortensis*. Double or Garden Daisy. Curt. 228. γ *B. fistulosa*. Red, quilled Daisy. δ *B. tubulosa*. White, quilled Daisy. ε *B. prolifera*. Hen and chicken Daisy.

Every body knows the Daisy. The father of our English poets has bestowed many lavish encomiums on this plant:

—“In special one called Se of the daie,
The Daisie, a floure white and rede,
And in French called *La bel Margarete*
O, commendable floure,” &c.

—“Above all floures in the mede
Then love I most those flouris white and
rede

Such that men call Daisies in our town.”

Chaucer is, perhaps, the first that takes notice of the *Horologium Floræ* or opening and shutting of flowers at a particular time of the day:

—“She that is of all flouris the floure,
Fulfilled of all virtue and honour;
And ever alike fair and fresh of hewe,
As well in winter as in summer newe,
As soon as ever the sunne ginneth west
To sene this floure, how it will go to rest,
For fear of night so hateth she darknesse,
Her chere is plainly spread in the bright-
nesse of the sonne ———.

Well by reason men it call maye
The Daisie, or else the Eye of the Daie,
And at the last these tho began anon
A lady for to sing right womanly
A Bargonet in praising the Daisie;

For as methought among her notis swete
She said “*Si douce est la Margarete,*”

Returned by Dryden in his own numbers:

“And then the band of flutes began to play,
To which a lady sung a virelay;
And still at every close she would repeat
The burden of her song, the *Daisy is so sweet,*
The *Daisy is so sweet,* when she begun
The troop of Knights and Damsels continued
on,
The concert and the voice so charmed my ear
And soothed my soul that it was heaven to
hear.”

It is a native of most parts of Europe in pastures; flowers almost all the year, and shuts up close every night and in wet weather.

The taste of the leaves is somewhat acrid; in some countries, however, it is used as a pot-herb. The roots have a penetrating pungency. It is ungrateful to cattle, and even to geese; it occupies therefore a large share of pasture lands, to the exclusion of grass and profitable herbs. It has been much recommended as excellent for fresh wounds externally, and against inflammatory disorders, &c. internally; but is now wholly out of use. Lady Margaret, Countess of Richmond, bore three white Daisies (Marguerites) on a green turf.

Varieties of the Garden Daisy are Double White, Red, White and Red striped, variegated, Scarlet and Pied. Double quilled or with fistular florets. Double cock's-comb shaped, white, red, and speckled. Proliferous, Childing or Hen and Chicken Daisy.

The common wild Daisy being a troublesome weed in pasture lands, and in the lawns and grass walks in gardens, is never cultivated.

The Garden Daisies flower in April and May, when they make a pretty variety, being intermixed with plants of the same growth; they should be planted in a shady border, and a loamy soil without dung, in which they may be preserved without varying, provided the roots are transplanted and parted every autumn; which is all the culture they require, except the keeping them clear from weeds.

These were formerly planted for edgings to borders, but they are very unfit for this purpose; because where they are fully exposed to the sun, they frequently die in large patches, whereby the edgings become bald in many places.

Mr. Curtis, on the contrary, thinks that Daisies appear to most advantage in edgings to borders, not that they are equal to box for this purpose, but because they enliven the border more, and add much to the general gaiety of the garden. He recommends the roots to be taken up the last week in September, or the first in October, to be divided into single plants, and to be planted three inches apart in a trench, not in holes by a dibble, spreading out the fibres, and pressing the earth closely round them; by which means they will not be subject to be drawn out of the ground by the worms. Such edgings should be replanted every autumn, because the plants, if they grow well, spread too wide. Mr. Curtis affirms, that if they remain undisturbed in the same spot, they will recur to their natural state and become single, notwithstanding Mr. Miller informs us, that he never observed them so to do.

3. BELLIS ANNUA (annual Daisy). Bot. mag. t. 2174. *Stem somewhat leafy.*—This is a low plant, seldom rising more than three inches high, with an upright stalk having leaves on the lower part, but the upper part naked, and supporting a single flower like that of the common Daisy, but smaller. Native of Sicily, Spain, about Montpellier, Verona, and Nice; flowering in April, and may be increased by seed sown in common garden soil.

BELLIUM.

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle naked; pericarp conical, with a paleaceous eight-leaved crown and armed pappus; leaves of involucrem, equal.*

1. BELLIUM BELLIOIDES (small Bellium). *Stolones creeping; scapes one-headed; leaves spatulate.*—This has the habit of the Daisy, but differs essentially from it in having a down to the seed. Leaves radical, obovate, quite entire, almost upright, scabrous on the upper surface, shorter than the petiole. It has filiform runners, rooting at the end, bearing both leaves and flowers. Scapes longer than the leaves, bearing one flower, which nods before it opens. Leaflets of the calyx ten, lanceolate, rather scabrous, parallel. Ray white, with oval emarginate corollets; disk yellow, quadridrifid corollets. Seeds somewhat hairy the down has eight

roundish chaffs; and eight bristles longer and placed alternately with the chaffs. Native of Italy, about Rome; and in the Island of Majorca; flowering in July and August. Increased by seeds, which should be sown in a sandy peat soil. Introduced 1796.

2. BELLIUM MINUTUM (dwarf Bellium). *Stem leafy, capillary.*—This is one of the minutest of plants. Stem capillary, an inch in length; the whole plant smooth and ascending. Leaves obovate, quite entire, smooth, shorter than the petiole. Peduncles one or two, terminating, the length of the whole plant, capillary, one-flowered. Calyx the size of a cabbage seed. The plant, examined with a glass, appears to have hairs scattered over it. Native of the Levant. Introduced in 1772, by Mons. Richard. It flowers from June to October. Propagated by dividing the roots in common garden soil.

BERARDIA.

Class Pentandria Digynia. Nat. Ord. *Bruniaceæ*.

The Characters are—*Calyx adhering to the ovary; petals cohering into a tube at the base; ovary half inferior, two-celled; cells one seeded; styles 2; fruit two seeded.*

1. BERARDIA PALEACEA (chaffy Berardia). *Leaves aul-shaped, acute, closely pressed to the stem, quite smooth, usulate.*—A shrub two feet high. The flowers are produced in corymbose heads. They are white, and appear from June to August. The chaffs between the florets stand out twice their length, pale, longer than the calycine leaves. A native of the Cape of Good Hope. Introduced 1791.

2. BERARDIA FRAGARIOIDES (strawberry-like Berardia). *Leaves linear, filiform, triquetrous; rib densely ciliated.*—A native of the Cape, where it grows to the height of two or three feet. Introduced 1794.

CULTURE. The species of this genus are easily cultivated in a mixture of peat and sand. Young cuttings strike root readily in sand with a bell-glass over them.

BERBERIS (from the Phœnician word *barar*, which expresses the brilliancy of a shell; alluding to their shining leaves).

Class Hexandria Monogynia. Nat. Ord. *Berberideæ*.

The Characters are—*Sepals 6, furnished on the outside with three scales; petals 6, with two glands on the inside of each at the base; stamens toothless.*

1. *BERBERIS VULGARIS* (common Berberry). Eng. bot. t. 49. *Spines three-parted; leaves somewhat obovate, ciliate-serrated; racemes many-flowered, pendulous; petals entire.*—The Common Berberry is a shrub rising to the height of eight or ten feet. The stems are upright and branched, smooth, and slightly grooved, brittle, with a large white pith, and covered with a whitish or ash-coloured bark which is yellow on the inside. Both stems and branches are armed with sharp thorns, which commonly grow by threes. Flowers in pendulous racemes towards the ends of the branches, with a bracte to each pedicel. Corolla yellow; petals frequently serrate about the edge; at the base of each are two orange-coloured dots, which are probably the nectaries. Anthers roundish, yellow. Stigma greenish. Berries at first green, but when ripe turning to a fine red colour. There are usually two, rarely three seeds. They are oblong, thicker at top, blunt, smooth, of a pale testaceous colour, and hard. The cotyledons or seed-lobes are of an elliptic form.

It is a native of the eastern countries, and now in most parts of Europe in woods, coppices, and hedges. In England, chiefly in a chalky soil, as particularly about Saffron Walden in Essex. It is even found on Mount Etna, at from five thousand to seven thousand five hundred feet above the level of the sea. The flowers appear in May, and the fruit ripens in September.

There are many varieties of this shrub. Mr. Miller mentions three: 1st. *Berberis fine nucleo.* *Bauh. pin.* 454. 2. Berberry without stone. 2nd. Berberry with white fruit. 3rd. *B. orientalis procerior fructu nigro suavissimo.* *Tournef. cor.* 1st. The first of these, he says, is certainly accidental, because the suckers, when transplanted commonly produce fruit with stones; and it is the age of the plant which occasions this variation. 2nd. The variety with white fruit seldom bears: the leaves are of a lighter green colour, and the bark is whiter than the common Berberry. 3rd. The third only differs in the colour and flavour of the

fruit. He makes the Canada Berberry to be a distinct species; and says that the leaves are much broader and shorter than those of the common sort, and that the fruit is black when ripe.

Other varieties are scarcely worth recording: as one without any aril; and another with simple spines, native of Syria, mentioned by Rauwolf. It is not uncommon to find some of the spines simple in the common Berberry.

The leaves of this shrub are gratefully acid. The smell of the flowers is offensive, when near, but pleasant at a certain distance. The berries are so very acid, that birds seldom touch them. The Berberry however is cultivated for the sake of these, which are pickled and used for garnishing dishes; and being boiled with sugar, form a most agreeable rob or jelly; they are used likewise as a sweetmeat, and are put into sugar-plums or comfits. The roots boiled in lye yield a yellow colour: and in Poland they die leather of a fine yellow, with the assistance of alum. Kine, sheep, and goats are said to eat it; horses and swine to refuse it.

The fruit of the Berberry is considered as a mild astringent acid, agreeable to the stomach, and of efficacy, (like other vegetable acids,) in hot bilious disorders, and in a putrid disposition of the humours. According to Prosper Alpinus, the Egyptians employ a diluted juice of the berries in ardent and pestilential fevers. Their method is to macerate them in about twelve times their quantity of water, and let them stand for about twenty-four hours, and then to add a little fennel-seed. The liquor is then pressed out and strained, and sweetened with syrup of citrons, roses, &c., and given plentifully as a drink. A concrete similar to cream of tartar may be obtained from the juice, by mixing it with lemon juice, in the proportion of two pounds of Berberry juice and two ounces of lemon juice, and digesting them in a sand-heat for two days; and then gently evaporating the filtered liquor to one-half, and setting it in a cellar for some days. The tartar incrustates the sides of the vessel, and is a grateful medicine in febrile disorders. In fact it is the essential salt of the Berberry.

The berries of this shrub are also made into an agreeable jelly, by boiling

them with an equal weight of fine sugar to a proper consistence, and then straining it. The leaves themselves of the Berberry are acid, and have been sometimes employed for nearly the same purposes as the fruit: they have also been used as an ingredient in salads. The inner yellow bark, which is austere and bitterish, has been sometimes used with success as a gentle purgative in the jaundice, in the form of a decoction, in ale or other liquors. In this manner it was used with success by the celebrated Mr. Ray.

Insects of various kinds are remarkably fond of the flowers of Berberry. Linnæus observed long since, that when bees in search of honey touch the filaments, the anthers approximate to the stigma, and explode the pollen.

Dr. Smith has given the following particular account of this curious phenomenon:

The stamens of such flowers as are open, bend back to each petal, and shelter themselves under their concave tips. No shaking of the branch has any effect upon them; but if the inside of the filaments be touched with a small bit of stick, they instantly spring from the petal, and strike the anther against the stigma. The outside of the filament has no irritability, nor has the anther itself any, as may easily be proved by touching either of them with a blunt needle, a fine bristle, a feather, or any thing which cannot injure the structure of the part. If a stamen be bent to the stigma, by means of a pair of scissors applied to the anther, no contraction in the filament is produced. From all this it is evident, that the spring of the stamens, is owing to an high degree of irritability in the side of the filament next the germ, by which, when touched, it contracts, that side becomes shorter than the other, and consequently the filament is bent towards the germ.

This irritability is perceptible in stamens of all ages; in flowers only so far expanded as to admit a bristle; and in old flowers ready to fall off.

If the germ be cut off, the filaments will still contract, and nothing being in their way, will bend over quite to the opposite side of the flower.

After irritation, the stamens will return to their original place. On being touched they will contract with the

same facility as before: and this may be repeated three or four times.

The purpose which this curious contrivance of nature answers, is evident. In the original position of the stamens, the anthers are sheltered from rain by the concavity of the petals. Thus probably they remain, till some insect coming to extract honey from the base of the flower, thrusts itself between the filaments, and almost unavoidably touches them in the most irritable part: thus the impregnation of the germ is performed; and as it is chiefly in fine sunny weather that insects are on the wing, the pollen is also in such weather most fit for the purpose of impregnation.

This shrub has lately acquired an ill name for a very mischievous effect, which, if true, should induce every husbandman to extirpate it from the vicinity of his corn lands. It is affirmed, that ears of wheat which grow near it never fill, and that its influence in this respect has been known to extend three or four hundred yards.

Mr. Macro, a very respectable farmer at Barrow in Suffolk, planted a Berberry bush in his garden, on purpose to ascertain the fact. He set wheat round it three succeeding years, and it was all so completely mildewed, that the best of the little grain it produced, was only about the size of thin rice, and that without any flour. He adds, that some which he set on the opposite side of his garden, one of the years, produced very good grain, although the straw was a little mildewed. There are other accounts from practical men corresponding with this of Mr. Macro's. We can scarcely however yield our assent to an appearance so strange and so wholly unaccountable, till the fact has been examined more accurately. The Berberry is so common in the hedges about Saffron Walden in Essex, and many miles round that place, where corn grows frequently up to the very hedge, that we can scarcely suppose such an interesting effect to have escaped observation. The celebrated Duhamel long since looked upon the mildewing power of Berberry as totally void of foundation; and M. Broussonet, who has bent his attention particularly to agriculture, assures us of the same thing, from his own observation.

2. *BERBERIS SINENSIS* (Chinese Berberry). Wats. den. brit. t. 26. *Spines three-parted; leaves oblong-obtuse, entire*.—A shrub, three to six feet high. The racemes are many-flowered, nodding. The berries are oval, of a deep red colour, one-two seeded. A native of China. Flowering in May. Introduced 1800.

3. *BERBERIS ARISTATA* (awned Berberry). Bot. mag. t. 2549. *Lower spines three-parted; upper ones simple; leaves membranous, serrated*.—This species is subject to considerable variety in the form of the leaves, these being sometimes nearly lanceolate, and even quite entire, and the spines under some circumstances are simple. It is a native of Nepal. Flowers yellow. They appear in April and May. Berries oblong. Introduced 1320.

4. *BERBERIS CRETICA* (Cretan Berberry). Flor. Græc. t. 342. *Spines three-five parted; leaves oval oblong*.—This never rises more than three or four feet high in England. It sends out many stalks from the root, which are strongly armed with spines at every joint; the leaves are produced without order, and are shaped like those of the narrow-leaved Box-tree; the flowers come out from between the leaves, each upon a slender peduncle, but these are not succeeded by fruit in England.

Stem and branches angular, purple, smooth, prickly. Lower prickles in threes, reflex; upper ones solitary, horizontal. Leaves in bundles, unequal, attenuated into the petioles, ovate, obtuse, quite entire, smooth, spreading. Flowers in racemes. The corolla has two minute glands at the base. Stigma capitate, flat. Native of the island of Crete, or Candia, and also of Japan. Cultivated in 1759 by Mr. Miller. It flowers in April and May.

5. *BERBERIS ASIATICA* (Asiatic Berberry). Deless. ic. t. 1. *Spines trifid or simple; leaves oval, cuneate mucronate, smooth*.—A shrub four to eight feet in height. The racemes are short, many-flowered, corymbose. The berries are oval, terminated by the thick, short style. Native of the East Indies. Introduced 1820.

6. *BERBERIS BUXIFOLIA* (box-leaved Berberry). Lam. t. 253. f. 3. *Spines three-parted; leaves ovate, quite entire*.—A small twisted shrub two to three feet high; native of the Straits of Ma-

gellan. The berries are of a blueish purple. Introduced 1825.

The Box-leaved sort is at present very rare in England; and while young, the plants being somewhat tender, are killed by severe frost.

It may be propagated by laying down the branches in the same manner as the first; but when the young plants are taken off, they should be planted in pots, and sheltered under a frame in the winter, till they have obtained strength, when they may be turned out of the pots, and planted in a warm situation.

7. *BERBERIS HETEROPHYLLA* (variable leaved Berberry). Hook. ex. fl. t. 14. *Spines three-parted; leaves ovate, lanceolate, glabrous, some of them entire, others furnished with three purgent teeth*.—A shrub; native of the Straits of Magellan. It rises to the height of six feet. The pedicels are solitary one-flowered, hardly longer than the leaves. The berries are roundish, four-seeded, purplish-blue, and about the size of a pea. The flowers appear in May and June. Introduced 1820.

8. *BERBERIS SIBERICA* (Siberian Berberry). *Spine three-seven parted; leaves lanceolate, obovate*.—This is a small shrub, scarcely a span high. Branches numerous, stiff, upright, covered with a grey or dirty yellow bark, except at the ends, which are green. Flowers congested, on a nodding, cylindric peduncle, thicker at the top. Calyx reddish yellow. Corolla yellow. Berry obovate, red. A native of Siberia, flowering in June and July. Introduced 1790.

9. *BERBERIS FLEXUOSA* (flexuose-branched Berberry). Ruiz et pav. t. 281. f. 2. *Spines three-parted; leaves obovate, glaucous, quite entire*.—A shrub, eight feet high. The racemes are aggregate, unequal, few flowered. Young berries ovate, oblong, drawn out into a neck at the apex and crowned by the orbicular stigma, adult ones oblong, black, four-five-seed. Native of Peru on rocks in the Andes; flowering from December to June.

10. *BERBERIS TINCTORIA* (Dyer's Berberry). *Leaves spatulate, spiny toothed, glaucous beneath*.—A native of Nellygerry Mountains in the Peninsula of India, where the inhabitants call it *tjahlon*, and employ a decoction of the wood and bark to dye linen and cotton of a bright yellow colour with the assistance of alum. It rises to the height

11. *BERBERIS ILICIFOLIA* (holly-leaved Berberry). *Spines three-parted; leaves ovate, tapering at the base, coarsely and spinulosely toothed.*—A shrub two to four feet high; flowering in July and August. Leaves resembling those of the Holm-oak, stiff, on very short petioles, quite entire at the base, but having two or three serratures on each side towards the middle, and terminated by a spine, as is also the point of the leaf, very smooth, and more glaucous beneath. Stipules palmate. Racemes terminating, very short: but the pedicels much prolonged. Berries ovate, bottle shaped. Found in the Terra del Fuego, by Sparman. The inhabitants there use the wood for bows, on account of its great elasticity. Introduced 1791.

CULTURE.—The species of this genus may be increased either by seeds, which is the most general method, sown either in the autumn or spring; or by suckers or layers; which should be put down in the autumn, when the leaves have fallen. They can also be increased by ripened cuttings, which will readily take root; they require to be taken about September or October.

The stove species do not require so much heat as the generality of stove plants. Several of them may be easily preserved in a frame.

The common sort is generally propagated by suckers, which are put out in great plenty from the root; but these plants are very subject to send out suckers in greater plenty than those which are raised from layers: therefore the latter method should be preferred. The best time for laying down is in autumn; the young shoots of the same year are the best for this purpose; these will be well rooted by the next autumn, when they may be taken off, and planted where they are to remain.

Where this plant is cultivated for its fruit, it should be planted single, not in hedges, as was the old practice, and the suckers every autumn taken away, and all the gross shoots pruned out; by this method the fruit will be much fairer and in greater plenty than those which are suffered to grow wild.

A few of these shrubs may be allowed to have a place in wildernesses, or plan-

which are much frequented, because their flowers emit a very strong odour.

BERCHEMIA.

Class Pentandria Monogynia. Nat. Ord. *Rhamnææ*.

The Characters are—*Calyx tubular, five-cleft; petals convolute; stamens inclosed; anthers two-celled; disk annular, flat; style simple; fruit nearly dry, two-celled.*

1. *BERCHEMIA VOLUBILIS* (climbing Berchemia). *Branches smooth, a little twining; leaves oval, mucronate, undulated; racemes axillary, terminal; drupe oblong.*—A climbing shrub, native of Carolina, flowering in June and July. The flowers are of a greenish-yellow colour, and the drupe violaceous. It is well adapted for bowers or trellis-work, and will grow in any common soil. Introduced 1714.

2. *BERCHEMIA LINEATA* (lined-leaved Berchemia). Osb. it. t. 7. *Branches downy, unarmed; leaves ovate, repand, netted beneath; flower hermaphrodite.*—It grows to the height of five or six feet, and is remarkable for its small and beautiful leaves, of a beautiful yellow green colour beneath, with red veins. The flowers are whitish, the anthers black. Native of China and Cochinchina, flowering in June and July. Introduced 1804.

CULTURE.—The species of this genus may be increased by ripened cuttings which will strike root readily in a pot of sand, under a hand-glass in heat.

BERCKHEYA (so named in honour of J. L. De Berckhey, a Dutch botanist.

Class Syngenesia Polygamia Frustanea. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle favose; pericarpis villous; puppus paleaceous, sometimes bristly paleaceous, ciliated; involucrem one-leaved, covered with imbricated leaflets.*

1. *BERCKHEYA GRANDIFLORA* (large-flowered Berckheya). Bot. Mag. t. 1844. *Leaves opposite, lanceolate, triple-nerved, spinosely toothed, underneath tomentose; leaflets of the calyx spinosely toothed.*—An ornamental shrub about three feet high, divided into a few upright branches. The peduncles terminal, six inches long, bearing a single, large, radiated, full, golden,

low flower, with a downy calyx. Native of the Cape of Good Hope, flowering in June. It requires the protection of a greenhouse. Increased cuttings, planted in loam and peat.

2. *BERCKHEYA OBOVATA* (smooth rubby Berekheya). *Leaves opposite, long, lanceolate, narrowed at base, ring-toothed, smooth, scales of involucre ciliate, spring.*—It rises to the height of two feet and upwards. Flowers yellow. The whole plant is smooth. Native of the Cape, flowering in July and August. Introduced 1794.

3. *BERCKHEYA INCANA* (hoary Berekheya). Jac. ic. t. 591. *Leaves alternate, ovate, spiny toothed, three-nerved, netted, oary, villous; scales of involucre oary, villous.*—A shrub two feet high. Native of the interior regions of the Cape of Good Hope, in dry situations, flowering in August. Flowers terminal, solitary, near three inches in diameter, of a deep yellow. Introduced 1739.

4. *BERCKHEYA UNIFLORA* (Single-flowered Berekheya). Thun. act. haf. t. 7. *Leaves alternate, lanceolate, spiny toothed, downy beneath; stem herbaceous, one-headed; scales of involucre lanceolate, spiny toothed.*—An ornamental greenhouse perennial; three feet high. Native of the Cape; flowering from June to August. The flower is yellow. It may be increased by dividing the roots and planting them in common garden soil. Introduced 1815.

CULTURE. The species of this genus may be increased by cuttings, which require to be planted in loam and peat, and have the protection of a green-house, as they are all too tender to bear the severity of our winters.

BERGERA (in honour of C. J. Berger, once Professor of Botany, at Kiel).

Class Decandria Monogynia. Nat. Ord. *Aurantiaceæ*.

The Characters are—*Calyx five-parted; petals 5; berry subglobular, one celled, with two seeds.*

1. *BERGERA KÖNIGII* (König's Bergera). Bot. cab. t. 1019. *Leaflets serrated.*—This is a very lofty tree, with the bark of Alder. The wood is hard and durable, and is used to make many implements of husbandry. Leaves alternate, petioled, unequal, pinnate; leaflets also alternate, petioled, ovate-lanceolate, rhomboid, narrower on one side, smooth, subserrate on the forward side. Corymbs terminating, compound, shorter

than the leaves, spreading. Bractes pressed close to the pedicels, solitary, lanceolate, small, caducous. Racemes upright, on short roundish pedicels; bractes lanceolate, permanent. Native of the East Indies, where it attains to the height of forty feet or upwards.

The fruit is of a yellow colour, of the form and size of a pigeon's egg. The pulp is easily separated when ripe, and gives out a kind of white juice before it is ripe, when cut or broken, which blackens the skin as the out-covering of a walnut does in Europe, but when ripe it is grateful to the palate; the taste resembling that of white currants, and is much sought after by the natives.

The flowers appear from April to July, they are small and of a whitish yellow colour. It thrives well in a mixture of peat and turfy loam, and may be increased by young cuttings, ripened at the bottom, taken off at a joint and placed in sand under a hand-glass in heat. Introduced 1820.

BERGIA (in honour of P. J. Bergius, a professor of Natural History at Stockholm, who wrote several botanical works between 1757 and 1780, particularly on mosses, and plants of the Cape of Good Hope).

Class Decandria Pentagynæ. Nat. Ord. *Caryophyllæ*.

The Characters are—*Calyx five-parted; petals 5; styles 5, approximate; capsule five-valved, five-celled, from the edges of the valves being bent inwards.*

1. *BERGIA GLOMERATA* (glomerate-flowered Bergia). *Leaves ovate, crenulate; flowers glomerate.*—A native of the Cape. The stem is diffused and branching, about six inches in length. The flowers are minute, and of a whitish colour.

2. *BERGIA VERTICILLATA* (whorl-flowered Bergia). Del. fl. æg. t. 26. f. 1. *Leaves lanceolate, denticulated at the apex; flowers in whorls.*—The stem is extremely simple, erect, smooth, and rather succulent. The flowers are sessile, very copious and much crowded. It is a native of Egypt, in rice fields about Rosetta and Damietta, flowering in July. The valves of the capsules continuing after it is ripe, form a kind of five-petalled whorl-shaped flower. Introduced 1820.

CULTURE. The species of this genus require to be kept in a moist situation, where they will ripen their seed, by

which they are readily increased. They are not worth cultivating except in botanic gardens.

BERINGERIA.

Class Didynamia Gymnospermia. Nat. Ord. *Labiates*.

The Characters are—*Borders of the calyxes longer than the tube, membranous, the greater angles rounded*

1. BERINGERIA ACETABULOSUM (saucer-leaved Beringeria). *Leaves heart-shaped, rough on their upper side, and hoary on their under, deeply serrated.*—A native of the Island of Candia. The stem is hairy, and about two feet high. The whorls are large. The flowers are small, pale purple; the corolla scarcely appearing out of the calyx. Upper lip erect. It flowers from June to August, is somewhat tender, and in very severe weather is killed unless they are screened from the hard frosts.

2. BERINGERIA PSEUDO DIC TAMNUS (shrubby white Beringeria). Flor. græ. t. 562. *Leaves cordate, concave.*—It rises with a shrubby stalk, two feet high, and dividing into many branches. The whole plant is very hoary with dense compact cotton. It flowers from June to August. Native of the island of Candia. Cultivated by Gerard in 1596.

CULTURE.—These plants are very hoary, and make a variety when intermixed with other plants. They very rarely produce seed in England, so are propagated by cuttings, which, if planted in a shady border the middle of April, will take root pretty freely.

BERRYA (in honour of Dr. Berry, a friend of Roxburgh's, who first introduced this tree into the botanic garden at Calcutta).

Class Polyandria Monogynia. Nat. Ord. *Tiliaceæ*.

The Characters are—*Sepals and petals 5; stamens numerous, rather connected at the base; style crowded by a trigonal cupitate stigma.*

BERRYA AMMONILLA (Ceylon Berrya). Rox. t. 164. *Capsule roundish, three-celled, three-valved, six-winged, with two horizontal wings on the back of each valve, with a dissepiment in the middle of each on the inside; seeds large, ovately-globose, covered with stiff hairs, two in each cell.*—A native of Ceylon, and one of their largest, and most useful timber trees; much of the wood is annually exported from Trincomally to the Coast

of Coromandel, hence the English name of *Trincomally wood*. The Cingaleses call it *Ammomilla*. It rises to the height of thirty-six feet and upwards. The branches are round and smooth. Leaves alternate, broad, cordate, entire, smooth, seven-nerved at the base. Panicles terminal, and from the exterior axils, large, very ramous, bearing numerous small yellow flowers. Introduced 1810.

CULTURE.—This tree will succeed well in a mixture of turfy loam and peat. Cuttings root readily in sand under a hand-glass in heat.

BERTEROA (named in honour of C. J. Bertero a pupil of Balbis and a friend of M. Decandolle, who speaks in high terms of his merits).

Class Tetradynamia Siliculosa. Nat. Ord. *Crucifereæ*.

The Characters are—*Silicle sessile, elliptical or obovate, with flat or concave valves; calyx equal at base; petals two-parted; the small stamens toothed.*

1. BERTEROA INCANA (hoary Berteroia). Fl. Een. t. 1461. *Silicles pubescent, somewhat ventricose.*—This plant in moist grounds is smooth, but in other situations the whole plant is hairy, with pressed stellate hairs. It rises to the height of two feet. The flowers are white, they appear from May to October. Native of many parts of Europe among rubbish, sandy and uncultivated places, exposed to the sun. Introduced 1640. It is readily increased by seed, sown in sandy loam.

2. BERTEROA MUTABILIS (changeable Berteroia). Vent. cels. t. 85. *Silicles compressed, flat, elliptical, smooth.*—An ornamental perennial, two feet high. The flowers when young white, pale rose colour, petals with yellowish claws bluntly bifid. A native of the Levant, flowering in July and August. Propagated by dividing the roots. Soil common garden mould. Introduced 1802.

3. BERTEROA OBLIQUA (oblique Berteroia). Flor. græ. t. 623. *Silicles flat, elliptical, downy.*—A native of Rome, Sicily, &c. It rises to the height of two feet differing from *B. incana* in the valves of the silicles being flat, and from *B. mutabilis* in the silicles being downy. The flowers are white; they appear in July and August. Introduced 1823.

CULTURE.—The species of this genus are all readily increased by seeds or by cuttings, they are however scarcely

orth cultivating, except in botanic gardens.

BERTHOLLETIA (in honour of L. C. Berthollet, the celebrated French chemist).

Class Monadelphia Polyandria. Nat. Ord. *Myrtaceæ*.

The Characters are—*Limb of calyx 5-lobed, deciduous; ovary four-angled; cells 4, ovulate; capsule large, opening by a lid; seeds triangular.*

BERTHOLLETIA EXCELSA (lofty Bertholletia). Bonp. pl. æq. l. t. 36. *Leaves alternate, oblong, quite entire, rather coriaceous.*—It rises to the height of one hundred and fifty feet. The young branches are leafy at the apex. Flowers cream coloured. M. Humboldt informs us that this tree is said to be originally from the province of Para, and is said also to form forests on the banks of the Orinoco. The triangular seeds known by the name of Brazil nuts in our shops, are the produce of this tree.

These nuts, or almonds, have been known to the Portuguese for a very long time, and are now known in all parts of Europe; in France under the name of *Chastaignes du Bresil*; in Spain under that of *Amedron*; in Portugal under *Castanas de Maranon*. The natives of the country call them *Juvic*, the Brazilians *Capucaya*. The Portuguese at Para carry them to Cayenne and Maranham, and sell them under the name of Tuka.

The capsule or fruit is as large as the head of a child, containing many triangular nuts, laid over each other in a regular manner. An oil is prepared from them, which is in great request in Brazil.

CULTURE.—Propagated by ripened cuttings, which root readily in sand, with a hand-glass over them in strong heat. When fit for transplanting, a mixture of loam and sand is the best soil for them.

BERTOLONIA (in honour of A. Bertoloni, an Italian botanist).

Class Decandria Monogynia. Nat. Ord. *Melastomaceæ*.

The Characters are—*Calyx campanulate, five-lobed; lobes sometimes obsolete; petals 5; anthers ovate-obtuse, opening by one pore; capsule trigonal, three-valved.*

1. **BERTOLONIA MACULATA** (spotted Bertolonia). *Leaves on long petioles,*

cordate, ovate, quite entire, pilose on both surfaces, and on the margins, five-nerved.

—A creeping herb. Native of Brazil, in the province of Bahia on the mountains, in shady humid places of woods. Peduncles axillary, bearing at the apex a short raceme of six-seven flowers. Flowers violaceous. Capsule three-valved. Seeds small, trigonal, cuneated, scabrous.

2. **BERTOLONIA OVATA** (ovate leaved Bertolonia). *Leaves petiolate, cordate, ovate, five-nerved, smoothish.*—The stems are very short, creeping, hairy. The leaves are scarcely an inch long. Flowers small, purple; they are disposed in rather secund spikes. Native of Brazil.

CULTURE.—The species of this genus are easily increased by seeds, or by dividing the plants; they grow best in a mixture of peat and sand. Some of the species are elegant little creeping plants, requiring the pots in which they are grown to be kept in pans of water.

BERZELIA (in honour of Berzelius, the celebrated chemist).

Class Pentandria Monogynia. Nat. Ord. *Bruniaceæ*.

The Characters are—*Calyx adhering to the ovary; segments unequal, gibbous; ovary inferior, one-celled, one-seeded; style simple; fruit indehiscent.*

1. **BERZELIA ABROTANOIDES** (southern-wood-like Berzelia). Wendl. t. 45. *Leaves ovate, ustulate at the apex, smooth, spreading on short petioles.*—A neat little greenhouse plant. The heads of flowers are white, globular, terminating, numerous. They are produced in the spring, and remain a great length of time. It may be increased by cuttings, and should be potted in sandy peat soil. Introduced 1791.

2. **BERZELIA LANUGINOSA** (woolly Berzelia). Wendl. t. 11. *Leaves triquetrous, spreading, callose at the apex, rather pilose.*—An elegant greenhouse plant. It rises to the height of three or four feet. The flowers, though not showy, make an agreeable variety; and as the plant grows up, the lower branches become pendulous, which has a beautiful effect. Native of the Cape. Introduced 1794.

CULTURE.—This is a pretty genus. The species are bushy shrubs, with heath like leaves; they are handsomest when young. They may be in-

situation in the greenhouse, as, if they be much crowded, the lower branches will decay and perish, which greatly disfigures them.

BESLERIA (after B. Besler, an apothecary of Nuremberg, joint editor with Jungermann of a sumptuous work, entitled *Hortus Eystettensis*, 1613).

Class Didynamia Angiospermia. Nat. Ord. *Gesnerææ*.

The Characters are—*Calyx five-parted; corolla tubular, gibbous on each side, with a five-lobed unequal limb; berry roundish, one-celled, many seeded; seeds nidulant.*

1. BESLERIA PULCHELLA (large flowered Besleria). Bot. mag. t. 1146. *Leaves oblong, ovate, rugose, crenate, decurrant down the petiole; calyx serrulate, coloured.*—The stem is shrubby, but very succulent. Peduncles axillary, rounded, hairy, bearing a corymb of six flowers. Pedicels of a purplish brown colour, inserted into the extremity of the peduncle, where there are a few unequal green coloured bractes. The calyx is of a scarlet colour. Corolla yellow, tube longer than the calyx. Native of Trinidad. Flowering in August; and requires the constant heat of the bark-store. Propagated by cuttings.

2. BESLERIA MELITIFOLIA (balm leaved Besleria). Sm. ex. bot. t. 54. *Peduncles branched; leaves ovate.*—It is a low shrub, of luxuriant growth, and silky texture. The stem is round, branched, downy. Leaves opposite, on long stalks. Flower stalks axillary. Flowers purple. It is a native of South America, and flowers with us in June or July. Introduced 1789.

3. BESLERIA LUTEA (yellow flowered Besleria). *Peduncles simple, clustered; leaves ovate-lanceolate, serrated.*—It rises with a ligneous stem six or seven feet high, dividing towards the top into many irregular branches. The flowers come out at the wings of the leaves, in large clusters, each having a separate footstalk; these are small, tubular, and of a pale yellow colour; they appear in July and August. Native of Guiana. Introduced 1739.

4. BESLERIA SERRULATA (saw leaved Besleria). *Peduncles simple, solitary;*

in July. Introduced 1806.

5. BESLERIA CRISTATA (crested Besleria). *Peduncles simple, solitary; calyxes coloured, serrated; corolla hairy, with an entire limb; leaves ovate.*—This shrubby plant, very different in its habit from the foregoing, climbs up trees, to which it adheres by means of roots thrown out of the joints. The twigs are round and long. The flowers appear from July to September. The calyx is bright scarlet. Corolla yellow. Before the dispersion of the pollen the filaments are upright, but afterwards they are strangely interwoven. Native of Martinico, &c. in moist mountainous woods, &c. Introduced 1739.

6. BESLERIA COCCINEA (scarlet calyxed Besleria). *Leaves ovate-acuminate, carnose.*—This shrub supports itself by climbing up trees. The branches and twigs are of a reddish brown colour. The leaves are eight inches long, and three broad, green above, paler beneath, with reddish nerves. The flowers grow in corymbs of three, four, and five flowers, each having a separate footstalk. The calyx is of a vivid scarlet, the corolla of a bright yellow. The ovary is two-valved, many seeded. The seeds are small, ovoid, and of a yellow colour.

From the brilliancy of its flowers, and the length of time they continue, this species is the most showy of the genus. Native of Guiana. Flowering from May to September. Introduced 1824.

7. BESLERIA INCARNATA (fresh coloured Besleria). *Leaves ovate, crenate, tomentose.*—It rises to the height of two feet and upwards, dividing into many branches. The flowers come out solitary from the wings of the leaves; they are monopetalous and flesh-coloured; they appear here in July and August; but in their native country, M. Aublet found them in flower and fruit in the month of April. The berry is spherical, two-celled, many seeded, enveloped in a soft pulp, of an agreeable taste. Native of Guiana. Introduced 1823.

CULTURE.—These plants grow naturally in the warm parts of America. The seeds should be sown on a hot-bed early in the spring; and when the

plants are come up half an inch high, they should each be transplanted into a small pot filled with light fresh earth, and plunged into a hot-bed of tanners' bark, observing to water and shade them until they have taken root; after which time they should have air and water in proportion to the warmth of the season, and the heat of the bed in which they are placed.

The second year these plants will flower, and sometimes they will perfect their seeds in this country; but they must be constantly preserved in the stove, for they will not live in the open air.

BETA.

Class Pentandria Digynia. Nat. Ord. *Chenopodææ*.

The Characters are—*Calyx five-leaved*; *corolla 0*; *seed kidney-form, within the substance of the base of the calyx*.

1. BETA VULGARIS (red garden beet). *Flowers clustered*; *lower leaves ovate*; *root fleshy*.—Garden red beet has large, thick, succulent leaves, which are for the most part of a dark red, or purple colour. The roots are large, and deep red, and on these circumstances their goodness depends; for the larger they grow, the more tender they will be, and the deeper their colour, the more they are esteemed. Native of the sea-coast of the southern parts of Europe.

a. Leaves shorter than in the white beet, more or less red, sometimes so dark as to have the name of black beet (*B. nigra*). Root white.

b. "Leaves very great and red, as is all the rest of the plant, as well root as stalk, and flowers full of a purple juice tending to redness; the midribs of the leaves are very broad and thick, like that of the cabbage-leaf, and they are equal in goodness with the leaves of cabbage, being boiled. It was brought unto me by that courteous merchant Master Lete; and grew with me in 1596, to the height of eight cubits, and did bring forth his rough seeds very plentifully. These, though taken from a plant of one colour, bring forth plants of many and variable colours, as the worshipful gentleman Master John Norton can verify." (GERARD).

x. Stem higher than the common red beet. Root thick, swelling like the Navew, and sometimes like the carrot,

within and without of a high blood red.

3. Leaves paler than in the white beet, of a greenish yellow colour. The root is of a fine high yellow, sweet and well tasted.

All these are only seminal varieties. The beet is very subject to change, and to degenerate, at least in our climate. I cannot but be inclined to the opinion of Linnæus, expressed in the *Hortus Cliffortianus*, and *Species Plantarum*, that the *cicla* is not specifically different from the *vulgaris*: and that both are probably derived from the *maritima*, cultivated on a rich soil, in southern climes.

The roots of red beet are boiled, sliced, and eaten cold, by themselves, or in salads; are used as garnish to dishes, and as a pickle. The green-leaved sort is most esteemed; the roots being the largest, and most tender.

Martial has justly marked the beet for its fatuity. It is said to be prejudicial to the stomach, and to afford little nourishment.

Taken in quantity it tends to loosen the belly. The juice both of the roots and leaves is said to be a powerful errhine, occasioning a copious discharge of mucus without provoking sneezing. A good sugar may be obtained from the juice of the fresh roots.

It was cultivated in 1656, by Mr. John Tradescant, jun.

2. BETA CICLA (white beet). *Leaves with very thick ribs*; *flowers three together*; *root scarcely any*.—The root of this sort seldom grows larger than a man's thumb: the stalks grow erect, and have oblong spear-shaped leaves, growing close to the stalk: the spikes of flowers are axillary, long, and have narrow leaves placed between the flowers. The lower leaves are thick and succulent, and their footstalks are broad. For these it is cultivated; the leaves being boiled as spinach, or put into soups, and the stalks and midrib of the leaf being stewed and eaten as Asparagus.

A large variety of this has lately been introduced from abroad, under the titles of *Racine de disette*, *Root of Scarcity*, and *Mangel Wurzel*.—See p. 204.

White beet is commonly sown by itself, and not mixed with other crops.

This is sown the beginning of March, upon an open spot of ground, not too moist; the seeds should be sown thinly, because the plants require room to spread; for when they are too close, the leaves being small and full of fibres, will be unfit for the purposes designed. When the plants have put out four leaves, the ground should be hoed, as is practised for carrots, carefully cutting up all the weeds, and also the plants, where they are too near each other, leaving them at least four inches asunder: if this is performed in dry weather, all the present weeds will be destroyed; but as young weeds will soon appear, in three weeks or a month's time, the ground should be a second time hoed over, to cut up the weeds, and thin the plants to a greater distance; for by this time they will be past danger, and should not be left nearer than six inches, if regard is had to the goodness of their leaves; and if it is of the Swiss kind, with broad leaves, the plants must not be nearer than nine or ten inches. If the second hoeing is well performed, and in dry weather, the ground will remain clean a month longer, when it should be hoed over a third time; which, if properly done, will destroy all the weeds; so that after this the plants will spread and prevent the weeds from growing, therefore will want but little cleaning for a considerable time, and the leaves will soon be fit for use, when the outer large leaves should be first gathered, leaving the small inner leaves to grow larger; so that a small spot of ground will supply a moderate family, and will furnish a new supply of leaves for two years, provided the plants are not permitted to run up to seed, for after that, their leaves will not be good: therefore those that are curious in their herbs, must sow a fresh spot of ground annually, because these plants naturally run up the second year; and although the roots may be continued longer, by cutting off the stalks when they begin to shoot, yet the leaves will not be so large or tender upon these roots, as upon the young plants.

The Ancients called the white beet *Ciela* or rather *Siela*, by contraction from *Sicula*, Sicilian beet; as we call the Savoy cabbages, *Saroy*. It is much grown in the south of Germany and

Switzerland, where the lamina of the leaves is used as spinach, or put in soups, and the midrib is boiled and eaten with melted butter or gray, as chard.

The red beet is frequently sown with carrots, parsnips, or onions, by the kitchen gardeners near London, who draw up their carrots or onions when they are young, whereby the beet will have room to grow, when the other crops are gathered; but where the crops are not timely removed from them, it will be a better method to sow them separately. It requires a deep light soil, for their roots run deep in the ground, so in shallow ground they will be short and stringy. The seed should be sown in March. The plants should not be left nearer than a foot distance, or in good land a foot and a half, for the leaves will cover the ground at that distance. The roots will be fit for use in the autumn, and continue good all the winter; but in the spring when they begin to shoot, they will be hard and stringy.

A few roots may be left for seed, in a sheltered spot of ground, where they may be defended from strong winds, which frequently break down their stalks, if they are not well supported, especially when the seeds are formed; which becoming heavy as it increases in bulk, is apt to weigh down the slender stalks upon which they grow. The seed will ripen in September, when the stalks should be cut off, spread on mats to dry, and afterwards threshed out and cleared, and put up in bags for use.

3. *BETA MARITIMA* (sea-side beet). Eng. bot. t. 285. *Flowers in pairs; stem diffuse; the branches much interwoven; root scarcely any.*—This differs from the others, according to Linnæus, in flowering the first year; in having oblique or vertical leaves; and in the leaflets of the calyx being equal, not toothed; also in having a perennial root. This is probably the parent of all the garden beets. It may be used as a spinach plant or a green.

It is a native of Holland and Great Britain, on the sea coast and in salt marshes. It is also found plentifully about Nottingham. Flowering in June and July.

4. *BETA PATULA* (spreading beet). *Flowers clustered; all the leaves linear.*

lanceolate.—The stem is short, hardly a foot high, very branching. Branches long, divaricate. Calyxine leaflets dilated at the base, but not toothed. It flowers in August. Native of the Island of Madeira. Introduced 1788.

BETONICA.

Class Didynamia Gymnospermia.
Nat. Ord. *Labiate*.

The Characters are—*Calyx awned; upper lip of corolla ascending, flattish; tube cylindrical.*

1. *BETONICA OFFICINALIS* (wood betony). Eng. bot. t. 1142. *Spike interrupted; helmet entire; middle segment of lower lip emarginate; calyx smoothish*.—Common wood betony has an upright stem, a foot high or more, not branched, or but very little in the wild state. Flowers in whorls, forming a short spike at the top of the stem, the lowermost remote: there are about fourteen flowers in a whorl, in some seventeen or eighteen. Corollas purple, varying to flesh colour and white. Native of woods, heaths, and pastures among bushes. Flowering from the beginning of July to September.

Betony, says Linnaeus, was formerly much used in medicine, but it is discarded from modern practice. When fresh it intoxicates. The leaves when dry excite sneezing. Sheep eat it, but goats refuse it. The leaves and flowers have an herbaceous, roughish, and somewhat bitterish taste, with a weak aromatic flavour. An infusion or light decoction of them may be drank as tea; or a saturated tincture in rectified spirit may be given in laxity and debility of the viscera. The sneezing quality of the dried leaves seems to be owing only to the rough hairs on them. The roots are bitter and very nauseous; in a small dose they vomit and purge violently.

This plant dyes wool of a very fine dark yellow colour.

There is a small mountainous variety not unfrequent, with a spike nearly globular; the leaves and flowers are smaller; but all these differences are owing to situation.

2. *BETONICA STRICTA* (Danish betony). *Spike oblong; helmet entire; middle segments of lower lip crenate wavy; calyx hairy; bractes ciliated*.—This differs greatly from the *officinalis*, the lower leaves being much broader and heart-shaped; those upon the stalks are spear-shaped, and rounded at the end;

the stalks are larger, stand upright, and are terminated by thicker spikes of flowers. Native of Denmark. Cultivated by Mr. Miller in 1759.

3. *BETONICA INCANA* (hoary betony). Bot. mag. t. 2125. *Spike interrupted; helmet bifid; middle segment of lower lip crenate; tube downy, incurved*.—*Betonica Incana* is a hardy perennial. Leaves ovate-cordate, crenate, villous and palish underneath, but scarcely hoary, as its name would import. Flowers bright flesh or rose-coloured; they appear in June. Native of Italy. Propagated by seeds, or by parting its roots in autumn. Introduced 1759.

4. *BETONICA ORIENTALIS* (Oriental betony). Lam. t. 507. f. 2. *Spike entire; middle segment of lower lip entire*.—It was first discovered by Tournefort in the Levant. Flowers in very close thick spikes at the top of the stalks; they are larger, and of a lighter purple than those of the *officinalis*; and appear in June and July. Intro. 1759.

5. *BETONICA ALOPECUROS* (fox-tail betony). *Spike leafy at base; helmet bifid*.—This has the appearance of *common-betony*, but the leaves are altogether heart-shaped, hirsute and serrate. The stem is a foot high, hirsute, obtusely quadrangular, and has two or three pairs of leaves; those immediately under the whorls are entire, broad, with the ends bent down. The whorls have from sixteen to twenty flowers, forming a short spike. The flowers smell like Elder. The calyx is sessile, villous, pentagonal; the teeth equal and acuminate: under each a small lanceolate bracte. The corollas are pale yellow: the upper lip oval, drawn out into a bifid point: the lower lip trifid, with the middle segment quite entire and bent upwards; the tube is flattened, and of the same length with the calyx. Filaments lanuginous. Germs smooth and shining.

It is a native of the mountains of Savoy, Piedmont, Austria, Silesia, and Provence: and was cultivated in 1759, by Mr. Miller.

6. *BETONICA GRANDIFLORA* (great flowered betony). Bot. mag. t. 700. *Spike leafy, interrupted; calyx villous at edge; teeth subulate; helmet obcordate*.—It is at once distinguished from every other known species by the large size of the brilliant purple flowers, and by the whorls being distinct and

leaves cordate, obtuse, pubescent on both sides. Cauline shorter, lower ones with short footstalks, upper ones sessile. Introduced 1800.

CULTURE.—All the sorts may be propagated by seeds or parting the roots. They require a sandy situation and a moist stiff soil, in which they will thrive better than in rich ground. The best time to transplant and separate the roots is in the autumn, but the seeds should be sown in the spring upon a shady border, and when the plants come up, they will require no other care but to keep them clean from weeds, and to thin them where they are too close.

All the species flower in May and June, and the seeds ripen in August.

BETULA (*betu* is the celtic word for the birch).

Class Monœcia Polyandria. Nat. Ord. *Betulineæ*.

The Characters are—*Barren flowers in a cylindrical catkin, its scales three-flowered; perianthium 0; stamens 10-12; fertile flower; scale of the catkin imperfectly three-lobed, three-flowered; perianth 0; styles 2; germen compressed, two-celled, abortive; nut with a membranous margin, compressed, one-seeded.*

1. **BETULA ALBA** (common birch). Eng. bot. t. 1508. *Leaves roundish, cuneiform, obtuse, lobed at the margin and serrated, somewhat gelatinous, downy at the axils of the veins beneath.*—The common birch tree is known at first sight, by the silvery colour of its bark, or rather *epidermis*, or outer thin covering to the bark; the smallness of the leaves in comparison with other timber trees; and the lightness and airiness of the whole appearance. It is of a middling or rather inferior size among other forest trees. Branches alternate, subdivided, very pliant, and flexible, covered with a reddish brown, or russet, smooth bark, generally dotted with white. Leaves alternate, bright green, smooth, shining beneath, with the veins crossing like the meshes of a net.

The most common names of the birch tree are, in German *Birke*; in Dutch *Berk*; in Danish and Scotch *Birk*; in Swedish *Biork* or *Bork*; in French *Bouleau*; in Italian *Betulla*, *Maio*, or

timber, yet has it its various uses: as for the husbandmen's ox-yokes, also for hoops, small screws, panniers, brooms, wands, bavin-bands, and wythes for faggots; and claims a memory for arrows, bolts, shafts (our old English artillery); also for dishes, bowls, ladles, and other domestic utensils in the good old days of more simplicity, yet of better and truer hospitality.

"In New England, out of an excrescence or fungus from the bole, boiled, beaten, and dried in an oven, they make excellent touchwood, and balls to play withal; and being reduced to powder, it is an infallible remedy in the hæmorrhoids.

"In many parts of the mosses in the West-riding of Yorkshire, are often dug up birch trees, that burn and flame like fir and candle-wood; and Pliny says, the Gauls extracted a sort of bitumen out of birch. Great and small coals are made by the charring of this wood; and of the tops and loppings, Mr. Howard's new tea.

"Before the invention of paper, the inner white cuticle and silken bark, which strips off of itself almost yearly, was used for writing tables; and there is a birch-tree in Canada, whose bark will serve to write on, and may be made into books, and of the twigs very pretty baskets. With the outward thicker and coarser part of the common birch are divers houses in Russia, Poland, and those poor northern tracts covered, instead of slates and tiles, laying turf three or four inches thick over; nay in Sweden, the poor people grind the very bark, to mingle with their bread-corn. Of this tree, the magisterial fasces anciently the cudgels used by the Lictor, for light faults, was made, as is now the gentler rods by our tyrannical pedagogues."

To this ample, and in some parts quaint account by our venerable planter, we may properly add the information of more modern times.

The wood of our birch is very white: women's shoe-heels and pattens, and packing-cases are made of it. It is planted along with hazel, to make charcoal for forges. In the northern parts

of Lancashire they make a great quantity of besoms with the twigs, for exportation.

The bark is of great use in dyeing wool yellow, and particularly in fixing fugacious colours. For this purpose it is best to use it dry, and to disbark trees of eighteen or twenty years' growth, at the time when the sap is flowing. The trees should stand, and be cut down the following year.

The highlanders of Scotland use the bark for tanning leather, and for making ropes; and sometimes they burn the outer rind instead of candles. With the fragments dexterously braided, the Laplanders make themselves shoes and baskets; they use large thick pieces set out, with a hole in the middle to fit the neck, for a surtout to keep off the rain. In Kamschatka they make hats and drinking cups of it.

The wood was formerly used by the Scotch highlanders for their arrows; but now by the wheelwright, and for most rustic implements; by the turner for trenchers, bowls, ladles, &c. and when of a proper size it will make tolerable gates, rails, &c. In France it is generally used for wooden shoes. It affords good fuel, some of the best charcoal, and the soot is a good lamp black for printers' ink. The small branches serve the highlanders for hurdles, and side fences to their houses. Moxa is made of the yellow fungous excrescences of the wood, which sometimes swell out from the fissures. The leaves afford good fodder to horses, kine, sheep, and goats. The seeds are the favourite food of the Siskin or Aberdevine; and this tree furnishes food to a variety of insects.

The vernal sap of the birch tree is well known to have a saccharine quality, and to make a wholesome diuretic wine. In the beginning of March, while the sap is rising, and before the leaves shoot out, bore holes in the bodies of the larger trees, and put fosses therein made of Elder sticks with the pith taken out, setting vessels under to receive the liquor. If the tree be large, you may tap it in four or five places at a time; and thus from several trees you may draw several gallons of juice in a day. If you do not get enough in one day, bottle up close what you have, till you get sufficient for your purpose, but the sooner it is boiled the better. Boil

the sap as long as any scum rises, skimming it all the time. To every gallon of liquor put four pounds of sugar, and boil it afterwards half an hour, skimming it well; then put it into an open tub to cool, and when cold tun it into the cask; when it has done working, bung it up close, and keep it three months; then either bottle it off, or draw it out of the cask when it is a year old.

"The birch," says our ancient Gerard, "serveth well to the decking up of houses and banquetting rooms, and for beautifying of streets in the Crosse and Gangweek, and such like."

If this tree serves such purposes no longer, it deserves however to be planted in parks and ornamental woods, to increase the variety; and its fragrant smell after rain justly entitles it to a place in the wilderness. The stem being straight, the bark smooth and white, and the foliage neat, the birch has a picturesque appearance when properly placed in ornamental plantations; either in the openings here and there, to show the foliage and hanging down of the twigs, or within, to display its silvery bark through the gloom.

But from what has been said, the birch, though in the lowest esteem as a timber tree, may yet deserve to be cultivated, not merely as an ornament, but for its various uses; especially since it will grow to advantage upon barren land, where better trees will not thrive: it will flourish in moist springy land, or in dry gravel and sand, where there is little surface: upon ground which produced nothing but moss, these trees have succeeded so well, as to be fit to cut in ten years after planting, when they have been sold for near ten pounds the acre standing, and the after produce has been considerably increased; and as the woods near London have been grubbed up, the value of these plantations has advanced in proportion: therefore, those persons who are possessed of such poor land, cannot employ it better than by planting it with these trees, especially as the expense of doing it is not great.

Native of Europe, from Lapland to the Subalpine parts of Italy; and of Asia, chiefly in mountainous situations; flowering with us in April and May.

β. The twigs are erect in young trees, but being very slender and pliant are

apt to become pendant in old ones; hence a variety no less beautiful than the weeping willow.

7. This is a remarkable variety, mentioned in the supplement of the younger Linnæus, to be found in Dalecarlia; described to have leaves almost palmate, with the segments toothed.

Other varieties, of a trifling nature, being chiefly slight differences in the shape of the leaves, are given by Linnæus, in his *Flora Suecica*, from Linder—viz.

a. With a rounder leaf, and pendant branches.

b. With a white broader acuminate leaf.

c. Brittle, with a blackish woolly leaf.

d. Saxatilis, terminalis, with an oblong leaf.

e. Dwarf birch.

2. BETULA NIGRA (black birch).

Leaves rhomboid, ovate, doubly serrated, acute, downy beneath, entire at base; scales of cones villous, with linear unequal lobes.—The black Virginian birch has the larger serrature of the leaves deeper and more remote, and besides these it has very small, fine, crowded ones; the base from an obtuse angle is quite entire. They are also broader, and grow on longer petioles. The twigs are pubescent, and the petioles villose. The branches are spotted, and more sparingly set on the tree than in our common sort.

It arrives at a much greater size, for it grows upwards of sixty feet in height, and is equally hardy with the European white birch. It has been hitherto propagated chiefly for ornamental plantations; but it is deserving to be admitted also among our forest trees. It was introduced in 1736 by P. Collinson, Esq.

There are several varieties of this species, as

a. Broad leaved Virginian birch.

b. Poplar leaved Virginian birch.

c. Paper birch.

d. Brown birch, &c.

3. BETULA LENTA (soft birch).

Leaves cordate-ovate, finely serrated, acuminate; scales of cones with blunt equal lobes, and elevated reins.—The vegetation of the soft birch is beautiful, and in a congenial soil its growth is rapid; the timber is close grained, beautifully variegated, and well adapted for cabinet work. The leaves, which

appear early in spring, possess a peculiar fragrance, which they retain after being dried in a stove, affording by infusion an agreeable diluent superior to some of the common teas of commerce.

In America it is known by the names of Canada cherry birch, mahogany birch, mountain mahogany, black birch, and sweet birch. This last appellation it has from the sweet scent the branchlets give when bruised. It grows sixty feet and more in height. The liquor flowing from its wound is used by the inhabitants of Kamtschatka without previous fermentation; with the wood they build sledges and canoes; and they convert the bark into food by stripping it off when green, and cutting it into long narrow pieces, like Vermicelli, drying it, and stewing it with their Caviar.

It abounds in the middle states of Pennsylvania, New York, and the Jerseys; but disappears altogether in the higher latitudes of the Northern States. It is thought a very fit tree for planting in the valleys of the mountainous districts of Britain. Introduced 1759.

4. BETULA NANA (smooth dwarf birch). Eng. bot. 2326. *Leaves orbicular, crenate.*—The European smooth dwarf birch is an upright shrub, seldom above two or three feet high. Trunk hard and stiff, with a roughish bark like that of the Elm, of a russet, or blackish purple colour. Branches slender, spreading, scattered, tapering, woolly, somewhat gummy at the ends. Leaves commonly three from each bud, but frequently single and alternate, rather more in breadth than length, having from ten to fourteen notches about the edge, entire at the base, smooth, glossy, veined on both sides. Petioles very short, smooth, and compressed. Sometimes the leaves are sessile or nearly so. Stipules in pairs, ovate, concave, upright, ciliate, brown, permanent. Catkins oval, erect, sessile, half an inch long. Styles purple. Native of the northern parts of Europe. Flowering in May.

Mr. Miller says, it is preserved in some curious gardens for the sake of variety, but is of no use here. It is however of signal use in the economy of the Laplanders. The branches furnish them with their bed and their chief fuel; and the seeds are the food

of the Ptarmigan, which makes a considerable part of their sustenance. The **Moxa** also is prepared from it, which they consider as an efficacious remedy in all painful diseases.

5. **BETULA PONTICA** (pontic Birch). Wats. D. B. tab. 94. *Petiole downy; leaves rhomboid, cut-toothed, obtuse, nearly smooth, with tufts of hairs in the axils beneath.*—A small tree, ten or twelve feet high. The epidermis is white, and foliaceous. The branches are dark brown, glabrous. The shoots pubescent. A native of Turkey. Flowering in April and May.

6. **BETULA POPULIFOLIA** (poplar leaved Birch). Mich. arb. t. 2. *Leaves deltoïd, with long points unequally serrated, quite smooth; scales of cones with lateral lobes roundish; petioles smooth.*—An elegant, rapid growing tree. Native of Canada, and the northern extremity of the United States. The wood is very soft, brilliant when polished, and perfectly white. From its speedy decay it is but little used. The twigs are too brittle for common brooms. The trunk of this species is clad in a bark of a pure white; but its epidermis, when separated from the cellular integuments, is incapable of being divided into thin sheets, as some of the other species are. Introduced 1750.

7. **BETULA EXCELSA** (tall Birch). Wats. den. brit. t. 95. *Leaves ovate, acute, serrated; scales of cones with lateral lobes rounded; petioles downy, shorter than peduncles.*—It rises to the height of seventy or eighty feet. The branches are dark brown and glabrous; the young shoots are of the same colour and densely pubescent. Native of North America. Introduced 1767.

8. **BETULA DAURICA** (daurian Birch). Pall. ros. t. 39. *Leaves ovate, narrowed at base, entire, unequalled-toothed, smooth; scales of cones ciliated, lateral lobes rounded.*—This species, when young, is scarcely to be distinguished from our common birch, but by the leaves. It does not grow so tall, and the trunk does not exceed a foot in diameter. The bark is gray, cleft longitudinally, and divides into brown scales, that have the appearance of being burnt. The branches are more subdivided, and more upright. The leaves are harder, smaller, and on shorter petioles. The wood of this tree is hard,

yellowish than that of the common sort, and in old trees marbled with brown and gray towards the middle; it is tougher, and therefore more fit for cart timber, and the use of the wheelwright; it is also used for making charcoal. Native of Dauria. Introduced 1786.

9. **BETULA OVATA** (oval-leaved Birch). Wats. D. B. t. 96. *Leaves ovate, doubly serrate, smooth; female peduncles branched; scales of cones with equal truncated nerved lobes.*—An ornamental species. Native of the Alps, Hungary, &c. It rises to the height of ten or twelve feet. The branches are cylindrical, warty, glabrous, and of a brownish colour. Introduced 1820.

10. **BETULA FRUTICOSA** (shrubby Birch). Wats. D. B. t. 97. *Leaves roundish, ovate, nearly equally serrate, smooth; female catkins oblong.*—This is always shrubby, rising with several stems from the same root, in boggy places not an inch thick, nor higher than a man; but on mountains it attains the thickness of the human arm, and grows to a much loftier stature; it is however constantly much branched from top to bottom, and of a very different habit from the common birch. The wood is not so white, and is waved transversely. The twigs are almost covered with the little resinous dots, which are found more or less in the other species. The buds are more copious, and always alternate. It is abundant in marshes, and on rocky mountains, and in the cold subalpine regions of Eastern Siberia, especially towards the lake Baikal.

11. **BETULA PAPYRACEA** (paper or canoe Birch). *Leaves ovate, acuminate, doubly serrate; veins hairy beneath.*—It is about seventy feet in height, and three feet in diameter. The branches are slender, flexible, and covered with a shining, brown bark, dotted with white. This bark, like that of the European species, is devoted to many uses; divided into very thin sheets, it forms a substitute for paper; and, placed between the soles of the shoes, and in the crown of the hat, it is a defence against humidity. But the most important purpose to which it is applied, and one in which it is replaced by the bark of no other tree, is the construction of canoes.

To procure proper pieces, the longest and smoothest trunks are selected: in

tached. These plates are usually ten or twelve feet long, and two feet nine inches broad. To form the canoe they are stitched together with the fibrous roots of the white spruce, about the size of a quill, which are deprived of the bark, split, and supplied with water. The seams are then coated with resin of the Balm of Gilead.

Great use is made of these canoes by the North American Indians, and by the French Canadians in their long journeys into the interior of the country: they are very light, and are easily transported on the shoulders from one lake or river to another, which is called the *portage*. A canoe calculated for four persons with their baggage weighs from forty to fifty pounds: some of them are made to carry fifteen passengers.

12. *BETULA LANULOSA* (woolly Birch). *Leaves deltoid, ovate, small; scales of female catkins densely woolly on the outside.*—It rises to the height of seventy feet, and is generally from two to three feet in diameter. The bark is thick, deeply furrowed, and of a greenish colour. The epidermis divides itself transversely into thin, transparent sheets, which do not possess that perfectly uniform and even texture of the paper birch. They are like coarse paper compared with fine. A native of North America. The twigs are extensively employed in the United States in the making of brooms, as they are not so brittle, and are more supple than those of the other species. Introduced 1817.

CULTURE.—The species of this genus are elegant rapid growing trees, well deserving of culture. They are all exceedingly ornamental, and more or less fragrant. The best method to cultivate the birch tree, is to furnish yourself with young plants from the woods where they naturally grow, and are generally found there in great plenty, but in places where there are no young plants to be procured near, they may be raised from seeds, which should be carefully gathered in the autumn, as soon as the scales under which they are lodged begin to open, otherwise they will soon

the best season, for sowing them, and advises the seeds to be sown in the shade, and adds, that in such a situation the plants will thrive better than when they are exposed to the full sun; for in all places where there are any large trees their seeds fall, and the plants come up well without care.

These young wild plants should be carefully taken up, so as not to destroy their roots. The ground where they are to be planted will require no preparation; all that is necessary to be done is to loosen it with a spade or mattock, in the places where the plants are to stand, making holes to receive their roots, covering them again when the plants are placed, and closing the earth hard to the roots. If the plants are young, and have not much top, they will require no pruning; but where they have bushy heads, they should be shortened to prevent their being shaken and displaced by the wind. When the plants have taken root, they will require no other care but to cut down the great weeds which would overhang the plants; which may be done with a sickle, being careful not to cut or injure the young trees. This need not be repeated oftener than two or three times in a summer the two first years, after which time the plants will be strong enough to keep down the weeds, or at least be out of danger from them.

These may be planted any time from the middle of October till the middle of March, when the ground is not frozen; but in dry land the autumn is the best season, and the spring for moist. The distance which they should be planted, is six feet square, that they may soon cover the ground, and by standing close, they will draw each other up; for in situations where they are much exposed, if they are not pretty close, they will not thrive so well.

If the plants take kindly to the ground, they will be fit to cut in about ten years; and afterward they may be cut every seventh or eighth year, if they are designed for the broom-makers only; but where they are intended for hoops, they should not be cut oftener than every twelfth year.

The expense of making these plantations in places where the young plants can be easily procured, will not exceed forty shillings per acre, and the after expense of cleaning about twenty shillings a year more; so that the whole will not be more than three pounds; and if the land so planted be of little value, the proprietor cannot make better use of his money: for when the wood is cut, it will repay the expense with interest, and a perpetual stock upon the ground. I have seen several of these plantations made upon land which would not let for one shilling per acre, which has produced from ten to twelve pounds an acre, clear of the expense in cutting, and this every twelfth year. The broom-makers are constant customers for Birch, in all places within twenty miles of London, or where it is near water carriage; in other parts the hoop-benders are the purchasers; but the larger trees are often bought by the turners, and the wood is used in making ox-yokes, and other instruments of husbandry.

When coppices of Birch, are wanted for the broom-maker, the plants from the nursery or the woods should be set five feet asunder: in eight years they will be ready to cut, when an acre will be worth about ten pounds: after this they may be cut every six years. For hoops, &c. they may be cut every twelfth year, and will be worth twelve pounds and upwards. Where the land will admit of the plough, a crop of corn is the best preparation.

The American sorts may be propagated by seeds in the same manner, and are equally hardy. As these grow more vigorously than the common sort, and thrive on the most barren ground, they may be cultivated to great advantage in England.

BIDENS (so called because its seeds are surmounted by two teeth).

Class Syngnesia Polygamia Frustanea. Nat. Ord. Compositæ.

The Characters are—*Involucre of many leaves, with many foliaceous bracteas at the base; receptacle plane, chaffy; corolla sometimes radiant; pericarps crowned with from two to five persistent awns, which are rough, with minute deflexed bristles.*

1. BIDENS NODIFLORA (sessile flowered Bidens). *Flowers discoid stalked; outer involucre three times as long as*

flower, leaves ovate, with one or two teeth on each side.—This is an annual plant, rising with stems eight or nine inches high, roundish, rough with white hairs, purple at the base. Branches divided, spreading; leaves smooth above, hairy along the veins underneath. The florets are few, and of a yellow colour. Native of the East Indies. Introduced 1732.

It requires to be sown upon a moderate hot-bed in the spring, and afterwards treated like other hardy annuals, planting them into the full ground the latter end of May. They will flower in June, soon after which the plants will decay.

2. BIDENS TRIPARTITA (trifid Bidens). Eng. Bot. t. 1113. *Leaves tripartite; leaflets lanceolate, deeply serrated, bristles of the pericarp 2-3.*—This species is obviously distinguished from the *cernua*, by its trifid leaves, a character more to be depended on than the uprightness of its flowers. It is also much more common, with us at least. That is generally found in water; this more frequently occurs on the borders of ponds, rivulets &c. where it flowers in August and September.

The root is annual. Stem one-three feet high, upright branched; branches opposite, moderately grooved, reddish, slightly rough to the touch. Flowers solitary, terminating, drooping a little; florets yellow. The seeds have been known to destroy gold-fish, by adhering to their gills and jaws. This plant dyes a deep yellow. The yarn or thread must be first steeped in alum water, then dried and steeped in a decoction of the plant, and afterwards boiled in decoction.

3. BIDENS CERNUA (nodding Bidens). Eng. Bot. t. 1114.—*Flowers drooping; bracteas lanceolate, entire, (longer than the involucre), leaves lanceolate, serrated, undivided; bristles of pericarp about four, erect.*—The root is annual. Stem from one to two feet high or more, upright, branched, a little hairy, purplish dotted with red, round at bottom, striated at top; the branches opposite, and nearly upright. Flowers remarkably drooping, of a bright yellowish-green, generally radiate. Flowering from July to September.

4. BIDENS STRIATA (stripe flowered Bidens). Swt. b. f. g. t. 237. *Leaves ternate; leaflets oblongly ovate, acute, cuneate at the base, serrate, with rough*

margins.—This species is a handsome autumn flowering plant. When in full perfection, is four feet high, bushy from the bottom, and completely covered all over with flowers and flower-buds. The rays of the flowers are generally five, spreading, white, but striped at the back with several prominent purple veins. Florets of the disk numerous, tubular, yellow. Native of Mexico. Introduced 1827.

5. *BIDENS CHINENSIS* (Chinese Bidens). *Flowers radiant; outer involucre length of inner; lower leaves pinnate, upper ternate; leaflets ovate subcordate, serratures unequal at base*.—In this species the leaflets are distinct, and the seeds have always four awns. The ray of the flower is white and minute. A native of China, flowering in July and August. Introduced 1801.

6. *BIDENS DIVERSIFOLIA* (different leaved Bidens). Bot. Mag. t. 1689. *Leaves bipinnate, leaflets serrate*.—A tender annual, requiring to be forced early in the spring to bring it into flower soon enough to mature its seeds. The flowers are yellow, and appear from September to November. Native of Mexico. Introduced 1811.

7. *BIDENS PROCERA* (tall Bidens). *Leaves bi-tripinnate pinnæ linear, acute, channelled, entire outer leaves of involucre blunt, downy*.—A finely divided deep green foliage disposed in pairs upon a branching stem of six or eight feet high, terminated by corymbs of a numerous golden coloured blossom, render this plant one of the most desirable of the genus. A Native of Mexico, flowering in November. Introduced 1822.

8. *BIDENS FRONDOSA* (smooth stalked Bidens). *Flowers discoid; outer involucre six times as long as flower; lower leaves pinnate; upper ternate, leaflets ciliated*.—It rises about three feet high, sending out many horizontal branches. The flowers are produced in small clusters at the ends of the branches; they are yellow and appear in July and August. It grows naturally in Virginia, Maryland, and Canada, where it is often a troublesome weed. Introduced 1710.

CULTURE.—Most of the species of this genus are herbaceous annuals; some however are shrubs. The second and third sorts, being common weeds in many parts of Europe, are seldom

cultivated in our gardens, but readily propagate themselves by seeds, in wet situations.

The other species require to be sown upon a moderate hot-bed in the spring, and afterwards treated like other hardy annual plants, planting them in the full ground, the latter end of May.

BIFORIS (from *bis* twice, and *foris* a door; in reference to the commissure being furnished with two holes).

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Margin of calyx obsolete; petals obovate, emarginate, with an inflexed point, outer ones nearly equal, radiating, and bifid*.

1. *BIFORIS FLOSCULOSA* (*flosculose Biforis*). *Umbels two-three rayed; fruits twin*.—The root is annual. The stem is almost upright, round, eighteen inches high, with many weak diffused branches. Leaves decomposed, the segments linear, slender, smooth. Umbels compound, small, concave; both involucre many cleft, subulate. Fruit twin, green tinged with brown, stronger both in smell and taste than the *Coriandrum sativum*. It is a native of the South of Europe, China, Cochin-China, &c. Introduced 1640.

2. *BIFORIS RADIAN*s (*rayed Biforis*). *Umbels five-rayed*.—It rises to the height of ten inches and upwards. The flowers are white; petals red. A native of Tauria, very frequent among corn. It possesses the same fetid smell when bruised, as the *flosculosa*. Flowers in June and July. Introduced 1817.

CULTURE.—The species of this genus will rise easily from seeds, if sown in autumn, but those which are sown in the spring rarely succeed, or at least do not come up till the following spring.

BIGELOVIA (in honour of J. Bigelow, M. D. of Boston N. A.)

Class Tetrandria Monogynia. Nat. Ord. *Rubiaceae*.

The Characters are—*Calyx two-four-fid; corolla infundibuliform, four-fid; capsule two-celled, two-parted, one-seeded*.

1. *BIGELOVIA VERTICILLATA* (whorl-flowered Bigelovia). *Spermatocoea verticillate*, Lin. *Leaves lanceolate, whorls globular*.—The stem is shrubby, three or four feet high; sending out a few slender branches, with narrow leaves on them. The flowers grow in thick globular whorls towards the top,

and one terminates the stem; they are small and very white. It is a native of Jamaica. Browne says, "This little bushy plant is frequent in the low and billy lands, bearing all its flowers at the upper joints of the branches, which are very numerous, and adorned with many small leaves." Flowers in June and July. Introduced 1732.

2. *BIGELOVIA STRICTA* (upright Bigelovia). *Leaves linear, lanceolate, marked with lines.*—Plant upright, six inches high, stiff. Branches upright. Flowers white, in narrow whorls. Native of the East Indies. Introduced 1817.

CULTURE.—The species of this genus may be propagated by seeds, sown on a hot-bed, and when the plants come up, transplant them on to a fresh hot-bed to bring them forward, and afterwards treat them in the same way with other tender plants. If they are placed in a stove, they will live through the winter, and produce good seeds the following year.

BIGNONIA (so named by Tournefort, in compliment to Abbe Bignon, librarian to Louis XIV).

Class *Didynamia Angiospermia*. Nat. Ord. *Bignoniaceae*.

The Characters are—*Calyx five-fid, cup-shaped; corolla campanulate, five-fid, ventricose beneath; pods two-celled; seeds with membranous wings.*

1. *BIGNONIA UNGUIS* (Barbadoes Trumpet-flower). Plum. Amer. t. 94. *Leaves conjugate, cirrhose; leaflets ovate, acuminate; peduncles axillary, one-flowered.*—It rises with slender stems, which require support. The leaves are small, entire, and placed opposite at every joint; at the same place comes out the tendrils, by which the plants fasten themselves to whatever grows near them: the flowers are axillary, yellow, and shaped like those of the Fox-glove. They are not succeeded by pods in this country. Native of the West Indies. Introduced 1759.

2. *BIGNONIA CAPREOLATA* (four leaved Trumpet-flower). *Leaves conjugate, cirrhose; leaflets cordate, lanceolate, lower leaves simple.*—The woody stems, which rise to a great height, climbing on the trees which grow near it, fastening to their branches by its claspers, and sending out many branches, which have leaves on them growing by fours, two on each side, growing opposite at the joints, and covered on their under side with a soft

hairy down, of a yellowish colour. The flowers are produced in loose panicles at the ends of the branches; they are of a pale yellow colour, and are succeeded by flat pods, a foot long. Native of Virginia. Introduced 1730.

3. *BIGNONIA ÆQUINOCTIALIS* (æquinoctial Trumpet-flower). *Leaflets ovate, lanceolate; peduncles two-flowered; pods linear.*—It has very weak slender branches, which put out tendrils at the joints, with four leaves, two on each side opposite; they are waved on their edges, of a bright green, and continue through the year; the branches ramble very far where they have room; the flowers are large, yellow, and produced at the joints of the stalks; they are succeeded by pods in this country. A native of Vera Cruz. Flowering from July to September. Introduced 1768.

4. *BIGNONIA CHAMBERLAYNI* (Chamberlayne's Trumpet-flower). Bot. Mag. t. 2148. *Leaves with a strong tendril at the end of the common footstalk; leaflets ovate-acuminate; racemes many flowered.*—This species is very nearly related to *B. æquinoctialis*, but differs from it in having a raceme of many flowers, and leaves frequently ternate. The flowers are large, and of a bright yellow colour. It is a native of Brazil. Flowering in July and August. Introduced 1818.

5. *BIGNONIA GRANDIFOLIA* (large leaved Trumpet-flower). Bot. Reg. t. 418. *Leaflets oblong, acute at each end; corymb trifid, terminal; peduncles, petioles, and branches rough.*—A magnificent climbing shrub, from the province of Caraccas in South America. It grows with such luxuriance that the branches will acquire nearly fifty feet in length in the course of a few months. The leaves measure above a foot and a half in length, and nine inches across. According to Jacquin the peduncles are three-flowered. The flowers are without scent. The calyx green, sometimes suffused with purple. Corolla deep yellow, nearly three inches long. Introduced 1816. Increased by cuttings, which root readily in sandy peat.

6. *BIGNONIA VENUSTA* (comely Trumpet-flower). Bot. Reg. t. 249. *Leaves smooth, upper conjugate, cirrhose, oblong, ovate, acuminate; peduncles corymbose, many flowered.*—A climbing shrub, with a reddish brown bark. It spreads itself on all sides, and continues

to produce large bundles of flowers for a long time in succession from the ends of the branches. The flowers are of a vivid orange-vermilion colour. It grows naturally in the neighbourhood of Rio Janeiro, and is very deserving of a place in every collection. Introduced 1816.

7. *BIGNONIA LEUCOKYLON* (white wooded Trumpet-flower). *The leaves digitate; leaflets lanceolate, acuminate, entire, smooth; flowers terminal, solitary.*—Sir Hans Sloane says, that this tree is as large as any in the Island of Jamaica, having a very great straight trunk covered with a smooth whitish bark, and a very hard white wood. The petioles are three or four inches long. The leaves fall off for some weeks, and then the flowers come out of the ends of the twigs, several together on peduncles an inch in length: they are white, like those of *stramonium*, and fall off very soon. The pod is five or six inches long, brownish, square, and marked with several eminent lines.

According to Browne, it grows to a considerable size, when raised in a kind soil, and is generally looked upon as a good timber-wood; but when its growth is not luxuriant, it is only fit for cattle-yokes, and such other small conveniences as require a tough yielding wood. The juice and tender buds of this tree are said to be an antidote against the poisonous juice of the Manchineel: they are indeed bitter, and may serve to prevent excoriations or blisters for a time, and thereby protract the operation of that caustic juice, until a part of its virulency wears off, or other assistance can be obtained; but emulsions and oily medicines will be always found to answer much better.

Mr. Miller says, that it rises with an upright stem to the height of forty feet, in the natural country of its growth; and that the seeds are dispersed by the wind to the neighbouring lands, where the plants come up in great plenty.

It was cultivated in 1759, by Mr. Miller, who says that he received it from Barbadoes by the title of White Wood.

8. *BIGNONIA BIJUGA* (Madagascar Trumpet-flower). *The leaves abruptly pinnate; leaflets elliptic, quite entire.*—The branches alternately compressed above, are covered with an ash coloured bark, and are smooth. Leaves four

inches long or more: leaflets an inch and half in length, smooth on both sides and shining. Racemes terminating. Peduncle jointed. Calyx bell-shaped, with the edge almost entire, and broader than the tube of the corolla. Native of Madagascar. Introduced 1822.

9. *BIGNONIA INDICA* (Indian Trumpet-flower). *The leaves bipinnate; leaflets roundish, ovate, cordate, acuminate; flower pentandrous; calyx tubular; corolla five-fid.*—Native of the East Indies and Cochinchina. It grows to a large tree, with ascending branches. Flower large, red, in erect, terminating racemes. Introduced 1775.

10. *BIGNONIA CHLONOIDES* (tree Trumpet-flower). *The leaves pinnate, with an odd one; leaflets ovate, entire, pubescent; corolla bearded, half pentandrous.*—This is a large tree, with a whitish ash coloured bark. Flowers solitary, from the divisions. Calyx hoary. Border of the corolla a little arched, red; the two upper segments reflex, yellow, with red dots; lower segments rough with hairs, curled at the edge. The fresh flowers immersed in water, give it a pleasant odour, and in the East Indies, of which it is a native, they sprinkle it over the temples in a morning, to correct the stagnant air. Introduced 1808.

11. *BIGNONIA CRUCIGERA* (cross-bearing Trumpet-flower). *The lower leaves ternate; leaflets ovate, cordate, acuminate; racemes axillary; stem mucronate.*—It rises to the tops of the tallest trees, sending out many branches, which have four narrow borders or wings running longitudinally, so as to resemble a square stalk. The flowers are in small clusters from the axils; they have pretty long tubes, spread open at top, and of a pale yellow colour: they are succeeded by flat pods a foot in length. It was sent to Mr. Miller from Campeachy. Flowers from June to September. Introduced 1758.

12. *BIGNONIA ECHINATA* (bristly fruited Trumpet-flower). *Aub. guin. t. 254. The lower leaves ternate, upper conjugate; petioles dichotomous, cirrhose; fruit echinate.*—This is a rambling shrub, climbing to the tops of trees by its very long and numerous branches. Leaves opposite. Leaflets from four to six inches in length. Peduncles axillary, two inches long, co-

rymbed, having several parcels which are opposite, and composed of three, four, or five flesh-coloured flowers. A native of Guiana. Introduced 1804.

13. *BIGNONIA CHERERE* (the cherere Trumpet-flower). Bot. Reg. t. 1301. *The leaflets ternate or binnate (one of the leaflets being converted into a tendril), somewhat cordate, oblong, cuspidate, with pellucid dots.*—A climbing shrub. Native of French Guiana, where it was discovered by Aublet, who informs us that the natives of that country manufacture its flexible shoots into baskets, and broad brimmed hats, which serve as umbrellas, keeping off alike the sun and the rain. The shoots are also used by them as cord.

It is a pre-eminently beautiful ornament in the conservatory, where it flourishes in abundance during the months of July, August, and September, requiring no particular care in its management; may be increased readily by cuttings. Introduced 1820.

14. *BIGNONIA PALLIDA* (pale Trumpet-flower). Bot. Reg. t. 965. *The leaves opposite, oblong, obtuse, cordate at base, a little pointed; blunt at end, flat, quite smooth.*—A native of South America, producing its delicate fugacious flowers in June. It rises to the height of eight feet. The branches of an olive-green, covered over with white scales; at the end of the shoots, dark brown. The leaves grow on pale yellowish-green stalks, are of a dark green colour, with a very prominent pale yellow-green rib; paler beneath, and firmly netted. Introduced 1823.

CULTURE.—This genus comprises more than one hundred species. They are trees or shrubs, inhabitants of the hot climates of the East and West Indies, and are eminently beautiful. The hardy species grow in any soil, but will not flower well unless the situation be warm. They are increased by cuttings of the roots, by layers, or by young cuttings in sand on gentle heat under a hand-glass or frame. The stove sorts grow freely in loam and peat; and young cuttings root in sand under a hand-glass.

BILLARDIERA (so named in honour of J. S. La Billardiere a French botanist). Class Pentandria Monogynia. Nat. Ord. Pittosporæ.

The Characters are—*Petals 5, al-*

ternate with the sepals; nectary 0; stigma simple; berry many-seeded.

1. *BILLARDIERA SCANDENS* (climbing Apple-berry). Bot. Mag. t. 801. *Peduncles solitary, 1-flowered; leaves somewhat hairy; fruit oblong, downy.*—It forms in this country a very low shrub, with variously twisted branches, but when growing in its native country, shaded by other shrubs, along the trunks of which its branches can twine, it undoubtedly ascends much higher. It is a native of New South Wales, and is said to be almost the only eatable fruit that grows spontaneously in that country, so famous for feasting the eye of the botanist; the taste is pleasant, and not unlike a roasted apple. Flowers in the summer months, is a hardy greenhouse plant; easily propagated by cutting or seeds.

2. *BILLARDIERA MUTABILIS* (changeable Apple-berry) (Bot. Mag. t. 1313. *Leaves lanceolate, linear; peduncles solitary, one flowered, smooth; fruit smooth.*—In every stage of its growth, this species is distinguished from *B. scandens* by its narrower and smoother leaves; and when in flower, the changeableness of the corolla, which is at first of a pale greenish-yellow and fades to a reddish-purple, affords a striking distinction. It is an elegant little climbing shrub, flowering all the summer months. Native of N. S. W.; is easily propagated by cuttings, or by seeds; which are frequently perfected with us. Introduced 1795.

3. *BILLARDIERA LONGIFLORA* (blue fruited Apple-berry). Bot. Mag. t. 1507. *Leaves smooth; corolla cylindrical, peduncles solitary, one flowered; petals very long, rolled inwards at edge; fruit globular, grooved.*—It is a free grower, with foliage of a lively green, and long pendulous pale yellow flowers, succeeded by bright blue berries. Flowers in July and August, and ripens its fruit in the latter month and September. Native of Van Dieman's Land; propagated by cuttings and by seeds. It has more disposition to climb than either of the two preceding species: catching hold of every thing within its reach. Introduced 1810.

4. *BILLARDIERA FUSIFORMIS* (long fruited Apple-berry). Lab. nov. holl. t. 90. *The leaves linear, flowers in axillary clusters, as long as leaves.*—A

5. BILLARDIERA ANGUSTIFOLIA (narrow leaved Apple-berry). *The leaves linear, entire, flat, glabrous.*—A climbing shrub. Native of New Holland. The pedicels are one-flowered. The flowers are cream-coloured and appear from May to September; and are succeeded by oblong glabrous berries. Introduced 1820.

CULTURE.—The species of this genus require to be grown in the conservatory, where they thrive well in an equal portion of loam and peat. They may be readily increased by cuttings, planted in a pot of sand with a bell-glass placed over them.

BILLBERGIA.

Class Hexandria Monogynia. Nat. Ord. Bromeliaceæ.

The Characters are—*Calyx superior; petals convolute, base scaly; stamens inserted into the base of the perianth, style filiform; stigma linear, convolute, seed naked.*

1. BILLBERGIA AMÆNA (pale-flowered Billbergia). Bot. Cab. t. 76. *Panicle lax, few-flowered, spreading; peduncles one-flowered; upper spathes fertile, as long as flower, spreading.*—This singular plant is a Native of South America, flowering with us in June; the base of the leaves are cupped, and form a space that generally contains water. The stem is upright ten-twelve inches high, spathaceously sheathed, sheaths single, scattered, lower ones brownish, upper ones bright crimson. Flowers tubular, two inches long, pale pea-green, bluish at the tips. It requires the constant heat of the stove. Should be potted in loam and peat; increased by suckers. Introduced 1810.

2. BILLBERGIA PYRAMIDALIS (pyramidal Billbergia). Bot. Reg. t. 203. *Radical leaves toothed, spiny; cauline entire.*—A simple scape rises from the bosom of the leaves eighteen inches high, upright and covered with mealy efflorescence, and clothed below the flowers with large bractes of a fine rose colour, which turn brown with age. Above the bractes the flowers grow in a thyrse-like spike. Calyx covered with a white mealy powder. Corolla

quantity in the folds of their bases; indeed, it has been asserted they are never found without, even in the hottest weather, in a tropical country; The leaves are radical, growing much the same as in the common *pine-apple*, convolutely folded, stained on the inside with purple, teeth of a burnt black colour: the largest leaves are from twelve to fifteen inches long and three broad. It requires to be kept in the bark-bed, where it flowers in March and April. It is readily multiplied by the numerous suckers it puts out. Native of Rio Janerio. Introduced 1733.

3. BILLBERGIA ZEBRINA (white barked Billbergia) Bot. Mag. t. 2686. *The leaves canaliculate, obtuse, dentately spinose, barred at uncertain intervals with white.*—The Hon. W. Herbert observes, that this beautiful parasite is a native of Rio Janerio, from whence he received it, cut with a portion of the wood from the stem of a great tree, to which its hard and knotty stumps adhered so tenaciously as not to be easily separated even by a hammer and chisel. The growth of the inflorescence was singularly rapid. It flowered in the stove at Spofforth in June, being planted in a small pot of peat on a warm flue. Introduced 1825.

4. BILLBERGIA FASCIATA (banded Billbergia). Bot. Reg. t. 1130. *The leaves glaucous, obtuse, erect-recurved, channelled; spinosely serrated, irregularly crossed with white downy bands.*—A remarkably handsome stove plant; the white bands of the leaves, and the rich rose colour of the bractes, give it a peculiarly beautiful appearance. Native of Rio Janeiro, flowering in August. Introduced 1825.

5. BILLBERGIA IRIDIFOLIA (drooping Billbergia). Bot. reg. t. 1068. *The leaves lanceolate-ensiform, undulate, acuminate sub-spinose.*—A truly noble plant. Native of Rio Janeiro, where it is found growing on trees. The leaves are a foot and a half long. The flowers make a beautiful appearance. The large bractes are of a vivid scarlet colour. The calyx and corolla of a

yellowish-green; with the tips of a deep blue. Flowers in April and May. Introduced 1826.

6. *BILLBERGIA NUDICAULIS* (naked stalked Billbergia). Hook. ex. f. t. 143. *Leaves linear-lanceolate, obtuse, mucronate; spinosely-serrated.*—The leaves are two feet long, of a dark lurid green, edged with sharp black teeth. The scape a foot and a half in length, whitish. The spike is terminal, simple and destitute of leaves. Flowers rather distantly inserted, with a small deep rose-coloured bractea at the base. Calyx of three yellow green leaflets; corolla of three yellow upright petals. A native of Trinidad, flowering from April to June. Introduced 1822.

7. *BILLBERGIA CRUENTA* (blood-stained Billbergia). Bot. Mag. t. 2892. *Leaves ligulate, obtuse, mucronate; serrato-spinous.*—The stem of this species is short and ascending. The leaves are numerous, two feet long and three inches broad; they are of a bright green colour, with blood-red stains, and greatly dilated at base, forming a cup. The flowers expand in succession; the calyx is green and shining. Corolla, claws white, limb spreading, segments blue, slightly striated. Native of Rio Janeiro, flowering in April and May. Introduced 1824.

CULTURE.—The species of this genus are beautiful Parasites. Dr. Lindley observes, that "In their native country, the seeds of these plants take root upon the branches of trees, or upon stones covered with decomposed vegetable matter, but always in situations where the atmosphere is highly charged with humidity, and where the temperature varies from 70 deg. to 90 deg. of Fahrenheit. Such, therefore, are the conditions to which Epiphytes must be submitted if we would hope to cultivate them successfully in these latitudes. The modes of creating an artificial climate of this description will so readily suggest themselves to the cultivator, that detailed directions for the purpose are quite unnecessary."

BILLOTIA (dedicated to Madame J. Billot of Turin, a famous botanical artist).

Class *Icosandria Monogynia* Nat. Ord. *Myrtaceæ*.

The Characters are—*Limb of calyx 5-cleft; lobes triangular, stamens twenty-three, shorter than the petals, berry*

three-celled; flowers sessile in globose heads.

1. *BILLOTIA MARGINATA* (marginate leaved Billotia). Labill. nov. holl. t. 148. *Leaves obovate-oblong, edged with white, ciliated; three-nerved.*—A shrub four to six feet high; flowers white, sessile, densely crowded into globose heads. They appear in June and July. A native of new Holland. Introduced 1820.

2. *BILLOTIA FLEXUOSA* (flexuous branched Billotia). Coll. hort. rip. t. 2. *Leaves linear-lanceolate, acuminate at both ends.*—It rises to the height of five feet with glabrous, flexuous branches. The flowers are white, and are produced from May to July. A native of New Holland, on the east coast. Introduced 1823.

CULTURE.—The species of this genus require a mixture of loam and peat. They are readily increased by cuttings of young wood, planted in sand with a bell-glass over them. A conservatory is best adapted for all the species, as they do not flower until they have attained a considerable size.

BIOPHYTUM.

Class *Decandria Pentagynia*. Nat. Ord. *Oxalideæ*.

The characters are—*Sepals 5, petals 5, stamens all distinct, the five outer shortest; styles 5, emarginate at end. Capsule ovate, round, somewhat five-cornered.*

BIOPHYTUM SENSITIVUM (sensitive Biophytum). Jacq. ox. t. 78. f. 4. *Peduncles many flowered at end.*—It is a very pretty annual, and if well managed, so as to acquire, as in China, a stem nine inches high, is quite a remarkable object, on account of the lively irritable pinnated foliage. The flowers are yellow, and appear from July to September. Native of the East Indies. Introduced 1824.

CULTURE.—The species of this genus may be cultivated in common earth, and propagated by seeds, which they produce in great abundance. They require to be kept in the Bark-stove.

BISCUTELLA (from *bis* and *scutum*; the fruit resembling a double shield).

Class *Tetradynamia Siliculosa*. Nat. Ord. *Cruciferae*.

The Characters are—*Silicle flat, bicusulate, with the cells laterally united to the axis; style long, persistent, embryo inverted.*

1. **BISCUTELLA, AURICULATA** (ear-podded Buckler mustard). *Calyx bluntly two-spurred; silicles smooth, rough with elevated dots in the centre.*—In a wild state this plant rises about a foot in height, but in a garden it generally grows near two feet high, dividing into several branches. At every joint there is one oblong entire leaf a little indented, those on the lower part of the stalk being broader and more blunt than those on the upper. The flowers are produced at the ends of the branches in loose panicles, and are of a pale yellow colour.

Silicle transversely ovate, compressed with raised dots, two-lobed; lobes rounded, separate at bottom, uniting at top in the style, which is much longer than the silicle; these lobes are one-celled, close not gaping, but separating from the axis: there is properly no partition, but only the flattened style interposed between the doubled silicles. Seeds lens-shaped, ovate, with an inflex beak, smooth, ferruginous. Seed-lobes ovate, plano-convex, thin.

The nectarous gland is remarkably large, and consequently the calyx is bagged out very much at bottom, in this species.

Native of the south of France and Italy. It was cultivated here in 1683, by Mr. James Sutherland, and flowers in June and July.

2. **BISCUTELLA ERIGERIFOLIA** (erigeron-leaved Buckler mustard). *Calyx bluntly two-spurred; silicles smooth, even, lobes at the end, somewhat meeting over the style.*—It rises to the height of eighteen inches; the flowers are pale yellow, and appear in June and July. Native of the south of Europe. Increased by seed sown in common garden soil. Introduced 1819.

3. **BISCUTELLA LYRATA** (lyre-leaved Buckler mustard). *Silicles hispid on each disk; radical leaves lyrate.*—The stem rises a foot and a half high, branching, almost leafless, naked, hispid at the base; flowers yellow. Native of Spain, flowering in June and July. Introduced 1799.

4. **BISCUTELLA APULA** (spear-leaved Buckler mustard). Fl. Græc. t. 629. *Silicles rough on the edge and disk, with a very fine down.*—The whole plant is rough with scattered hairs. Stem upright, a foot high, with two or three

branches; each branch is terminated by a close spike of pale yellow flowers, with a shorter style than in the other sorts. It flowers in June and July. Native of Italy, cultivated in 1759, by Mr. Miller.

5. **BISCUTELLA CORONOPIFOLIA** (Buckhorn-leaved Buckler mustard). *Silicles smooth, even.*—In this species the root leaves are lanceolate, deeply toothed to the very middle with three or four teeth on each side, rough on both surfaces with distinct hairs. Stem leaves clasping, cordate, lanceolate, less toothed, few. A native of the south of Europe, in sterile places exposed to the sun; flowering in July. Introduced 1790.

6. **BISCUTELLA LÆVIGATA** (smooth-podded Buckler mustard). *Silicles smooth, even.*—According to Jacquin, the stems are upright, round, smooth or hirsute, commonly simple at bottom and branched at top. Leaves oblong, attenuated at the base, blunt or sharpish, thickish, either quite entire or with few serratures, rough on both sides with white hairs, but sometimes scarce observably hairy: root-leaves many; stem-leaves smaller, sessile, and more entire. Flowers at first in a kind of umbel, but afterwards in a raceme. Leaflets of the calyx smooth, yellow, oblong, blunt, very concave, patulous. Petals twice as long as the calyx, yellow; as are also the filaments. Pistil green. Silicle very smooth, sometimes in the Alps three or four-winged. The whole plant is acrid. The root is perennial; but according to others it is annual. It is a native of Italy and Austria. Being found at very different heights on the mountains, it varies much in stature, from half a foot to a foot and a half. In lower situations it flowers in April and May, in higher ones in July and August; in our gardens in June and July. It was introduced here in 1777 by Mons. Thouin.

7. **BISCUTELLA HISPIDA** (hispid Buckler mustard). *Silicle smooth, with elevated rough points on disk, not overhanging, style at end.*—A hardy annual, differing from *auriculata* in being more hairy, and the greater dentation of the leaves, even of the superior ones, which in *auriculata* are generally quite entire, or nearly so. The stem is branched, leaves sessile, flowers yellow. Native of the south of France and

the north of Italy. Flowering in June. Introduced 1824.

8. **BISCUTELLA SEMPERVIRENS** (shrubby Buckler mustard). *Silicles smooth, rough with elevated dots on disk; leaves mostly radical, erect, linear-lanceolate, hoary, nearly entire.*—Stems suffruticose, a hand's breadth in height, prostrate, simple, the thickness of a goose-quill, leafy at top. Leaves crowded, with a thick nap, like *Cheiranthus incanus*, tooth serrate, with the edge bent back; the flowering-stem springing up among the leaves, simple and almost leafless itself. Raceme terminating, compound, not much prolonged. Silicles of the same size and form as in the second species. This is the most distinct of any from the rest.

Native of Spain. Introduced in 1784, by Messrs. Lee and Kennedy.

CULTURE.—The species of this genus are rather numerous; they are all annual plants, except the last, which perish soon after they have perfected their seeds. These should be sown either in spring or autumn, upon a border of light earth, in an open situation, where they are to remain. Those which are sown in autumn will come up in about three weeks, and the plants will live through the winter without any protection, and flower earlier the following summer, whereby good seeds may always be obtained; whereas those which are sown in the spring do, in bad seasons, decay before their seeds are ripe. The autumnal plants flower in June, and the spring plants in July, and their seeds ripen about six weeks after; if these are permitted to scatter, there will be plenty of young plants produced without any care.

They require no farther culture, but to keep them clean from weeds, and thin the plants where they are too close, leaving them eight or nine inches asunder. They are preserved in the gardens of those who are curious in botany, but they have no great beauty to recommend them.

The perennial species are well adapted for ornamenting rock work, as they prefer a dry sunny situation.

BISERRULA (from *bis* twice, and *serrula*, a little saw).

Class *Diadelphia* Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Legume two-celled, flat, with a contrary dissepiment, serrated on each edge.*

BISERRULA PELECINUS (common hatchet Vetch). Tourne. inst. t. 234.

—This is an annual plant, which grows naturally in Italy, Sicily, Spain, and the south of France. It sends out many angular stalks, which trail on the ground, subdivided into many branches, with long winged leaves, composed of many pairs of leaflets, terminated by an odd one; these are heart-shaped: toward the upper part of the branches come out the peduncles, which sustain several small purplish flowers.

Legume oblong, serrate on both edges, with a longitudinal suture in the middle, four-valved: partition very narrow, simple. Seeds in each cell eight, round-kidney-shaped, smooth, yellowish. Seed-lobes semi-lunar. The legume is not simple but double, composed of two partial ones, placed side by side and coalescent. Cultivated here in 1640.

CULTURE.—It is propagated by seeds, which in this country should be sown in the autumn, on a bed of light earth, where the plants will come up in about three weeks, and will live in the open air very well. These should be sown where they are designed to remain, or transplanted very young; for when they are large, they will not bear removing. When the plants are come up, they will require no other care but to keep them clean from weeds; and when they are too near, they should be thinned to about a foot distance from each other. They flower in June, and the seeds ripen in September.

The seeds of this plant may also be sown in the spring, and treated in the same manner as before directed; but these will not flower till the middle or end of July, so unless the autumn proves warm, they will not ripen seeds; for which reason I have directed their being sown in the autumn, as soon as they are ripe. Two or three of these plants may be allowed a place in gardens for the sake of variety, but they have not much beauty.

BIVONÆA (in honour of A. Bivonia Bernardi, a celebrated Sicilian botanist).

Class *Tetradynamia* Siliculosa. Nat. Ord. *Cruciferae*.

The Characters are—*Silicle oval,*

smarginate, with keeled valves, and four six-seeded cells.

BIVONÆA LUTEA (yellow flowered *Bivonæa*).—This is a small smooth, glaucous, annual plant, from one to three inches high. Stem erect, either simple or branched from the base. Leaves half an inch in length, the lower ones spatulate; the others ovate-oblong, bluntish, all having one or two large teeth at each side. Flowers bright yellow. They are small, not many together, in short terminal corymbs, becoming elongated clusters of rather large, rounded, reticulated pouches, with a few seeds in each cell. Native of dry mountainous places near Palermo. Flowering in April and May.

CULTURE.—This species is a pretty annual, well adapted for rock work, and may be increased by seed sown in dry sandy soil, where they are intended to remain.

BIXA (the American name of the tree).

Class Polyandria Monogynia. Nat. Ord. *Bizineæ*.

The Characters are—*Calyx five-toothed; petals 10; capsule hispid, two-valved.*

BIXA ORELLANA (heart-leaved *Arnotta*). Bot. Mag. t. 1456. *Leaves smooth on both sides.*—This shrub rises with an upright stem to the height of ten or fifteen feet, sending out many branches at the top, forming a regular head. These are garnished with heart-shaped leaves ending in a point, which have long foot-stalks, and come out without any order. The flowers are produced in loose panicles at the end of the branches, of a pale peach colour, having large petals.

Capsule ovate-cordate, turgidly lenticular, hispid all round with bristle-shaped prickles: the valves are clothed within with their proper membrane, and in the middle they have a prominent longitudinal groove, to which the seeds are fastened; there are about twelve to each valve, turbinate, with a depressed streak on one side, and a brown tubercle at the top; they are scarlet.

Native both of the East and West Indies. The capsules in the latter are ovate-acuminate, smaller, and the prickles not so close. Seeds subtrigonal, like grape stones, with so deep a furrow as to appear two-lobed. Seed-lobes less flexuose, and the whole embryo re-

latively smaller. It was introduced here in 1690, by Mr. Bentick.

Linnaeus has adopted the South American vernacular name of *Bixa* from Oviedo; in Holland, Denmark, and other northern countries, it is known also by that name. In Holland it is likewise called *Orleanse*. In German, *Orleansbaum*, *Bischofsmutze*, *Anotta*. In England we have taken the latter of these names, spelling it variously, *Arnotto*, *Arnotta*, *Anotta*, *Anato*, *Anota*, *Annoto*. The French have adopted the Brazilian name *Urucu*, or *Urucu*, spelling it *Roucouyer*, *Roucou*, or *Rocurier des Indes*. The Portuguese have also the same appellation *Urucu*, or *Uracueira*. In Spanish it is *Anato* or *Atole*. In the Mexican language *Achiottl*. Scalliger calls it *Arbor finium reguadorum*, because the Mexicans made plans, and marked the boundaries of their lands on tablets, with the colour prepared from the berries. Tournefort named it *Mitella*, from the resemblance of the capsule, when open, to a mitre.

The drug called *Terra Orellana* or *Orleana*, *Roucou* or *Arnotto* is thus prepared from the red pulp which covers the seeds. The contents of the fruit are taken out, and thrown into a wooden vessel, where as much hot water is thrown upon them as is necessary to suspend the red powder or pulp; and this is gradually washed off with the assistance of the hand, or of a spatula or spoon. When the seeds appear quite naked they are taken out, and the wash is left to settle; after which the water is gently poured away, and the sediment put into shallow vessels, to be dried by degrees in the shade. After acquiring a due consistence, it is made into balls or cakes, and set to dry in an airy place, until it is perfectly firm.

Some persons first pound the contents of the fruit with wooden pestles; then covering them with water, leave them to steep six days. This liquor being passed through a coarse sieve, and afterwards through three finer ones, it is again put into the vat or wooden vessel, and left to ferment a week. It is then boiled until it is pretty thick, and when cool is spread out to dry, and then made up into balls, which are usually wrapped up in leaves. *Arnotto* of a good quality is of the colour of fire, bright within, soft to the touch, and dissolves entirely in water.

It is reputed to be cooling and cordial, and is much used by the Spaniards in their chocolate and soups, both to heighten the flavour and to give them an agreeable colour.

It is esteemed good in bloody fluxes and disorders of the kidneys. Mixed with lemon-juice and a gum, it makes the crimson paint, with which the Indians adorn their persons. It was formerly used by dyers to form the colour *Aurora*; but at present it is not held in such estimation as a dye, though it still maintains its ground with painters.

Arnotto is well known to be the drug which is used for dyeing cheese in Gloucestershire, under the name of cheese-colouring. It is used in Holland for colouring their butter.

The bark makes good ropes for the common plantation uses in the West Indies; and pieces of the wood are used by the Indians to procure fire by friction.

CULTURE—This plant is propagated by seeds, may be cultivated with great ease, and is planted in many parts of Jamaica, Barbadoes, Cayenne, &c. in rich soils and shady situations, shooting luxuriantly near rivulets.

Here also it is propagated by seeds, which are annually brought from the West Indies in plenty. These should be sown in a small pot, filled with light rich earth, and plunged into a hot-bed of tanners' bark; where, if the bed is of a proper temperature of heat, the plants will appear in about a month after: when these are about an inch high, they should be shaken out of the pot and carefully separated, so as not to tear off their tender roots, and each planted in a small pot filled with some rich light earth, and plunged into a fresh hot-bed of tanners' bark, observing to shade them every day until they have taken new root; after which they must be treated as other tender plants from the same country, by admitting fresh air to them in proportion to the warmth of the season; and when the heat of the tan declines, it should be turned up to the bottom, and, if necessary, some fresh tan added to renew the heat. The plants must be refreshed three times a week with water in summer, but they must not have it in great quantities, for their roots often rot with much wet. If the plants are raised early in the spring, and properly managed, they

will be a foot and a half high by the autumn, when they should be removed into the bark-stove, and plunged into the tan-bed. During the winter they must have but little water, and while the plants are young, they must have a good share of warmth, otherwise they are very subject to cast their leaves, and frequently lose their tops, which renders them unsightly. They must be constantly kept in the bark-stove, for those plants which have been placed in a dry stove have never made much progress. I have had many of these plants seven or eight feet high, with strong stems and large heads, but have only had one produce flowers; nor have I heard of its flowering in any of the gardens in Europe, for in the Dutch gardens they have no plants of any size.

BLACKWELLIA (in honour of Elizabeth Blackwell, an eminent English artist; she published in 1735 a collection of drawings, entitled "Curious Herbal.")

Class Dodecandria Pentagynia. Nat. Ord. Homalinea.

The Characters are—*Tube of calyx short; limb ten-thirty parted, inner lobes smallest; stamens inserted in the calyx, at the base of the glandless lobes; ovary conical above; styles 3-5; capsule one-celled, many-seeded; seeds fixed to the parietes.*

1. **BLACKWELLIA PANICULATA** (panicled flowered Blackwellia). *Leaves ovate-roundish, toothed, smooth.*—A small tree. Native of the Island of Bourbon. The bark is white. The panicles of flowers are terminal, and appear in June and July; they are white. Introduced 1820.

2. **BLACKWELLIA GLAUCA** (glaucous Blackwellia). Vent. Choix. t. 35. *Leaves ovate-oblong, obtuse, a little toothed, smooth, glaucous.*—A shrub. Native of the Mauritius. Racemes axillary, panicled. Flowers white. Introduced 1824.

3. **BLACKWELLIA NIPAULENSIS** (Nipaul Blackwellia). *Leaves oval, acuminate, serrate-toothed, smooth.*—A shrub. Native of Nipaul. Branches gray, marked with white spots. Racemes branched, many flowered. Flowers small, white. Introduced 1824.

4. **BLACKWELLIA AXILLARIS** (axillary racemed Blackwellia). Lam. ill. t. 412. f. 1. *Leaves ovate, a little crenated, smooth.*—A tree. Native of Madagas-

ear. Spikes axillary, long, simple, nodding. Flowers white. Introduced 1824.

5. *BLACKWELLIA SPIRALIS* (spiral Blackwellia). As. rec. 401. *Leaves obovate, with glandular teeth, rather pubescent beneath.*—A handsome tree. Native of Peru. It grows to a considerable size, with long and slender pendulous branches, which it emits from the base almost of the stem. The leaves are six to eight inches long, two to three broad. Flowers white; they emit a peculiarly fœtid smell. Introduced 1820.

6. *BLACKWELLIA PADIFOLIA* (padus-leaved Blackwellia). Bot. Reg. t. 1308. *Leaves oval, denticulated, smooth.*—Dr. Lindley observes that this is "an erect hardy greenhouse shrub, growing well in the open border during the summer; very handsome when in flower, and increasing freely by cuttings. The white blossoms in a mass have the appearance of those of the Bird Cherry; examined singly, they resemble nothing so much as an elaborately-finished shuttlecock." Native of China. Introduced 1824.

CULTURE.—The species of this genus are not very ornamental, as the flowers are extremely insignificant; they are of a whitish green colour. The foliage however is pretty. They will grow freely in a mixture of loam, sand, and peat; ripened cuttings root readily in sand, with a hand-glass placed over them, in a moderate heat.

BLÆRIA (named after P. Blair, M. D. author of *Botanic Essays*, 1730).

Class Tetrandia Monogynia. Nat. Ord. *Ericææ*.

The Characters are—*Calyx four-parted; corolla short, tubular with a four-cleft limb; stamens 4-6, with linear, flattened, glabrous filaments; stigma obtuse.*

1. *BLÆRIA ERICOIDES* (heath-like *Blæria*). Bot. Cab. t. 85, and 153. *Leaves four in a whorl, oblong, obtuse, ringed.*—This has the stature of Common Heath. Flowers terminating, white, with a tinge of purple. Corollas tubulous, erect. Style capillary, longer than the two parted scabrous anthers. It flowers from August to October. Native of the Cape. Introduced 1774.

2. *BLÆRIA MECOSA* (moss-leaved *Blæria*). *Leaves four in a whorl; calyx pilose.*—The stem is frutescent, a foot

high, determinately branched, with white lines. Flowers terminal, on peduncles the length of the flowers. They appear from June to August. Native of the Cape of Good Hope. Introduced 1774.

3. *BLÆRIA CILIARIS* (ciliated *Blæria*). *Leaves four in a whorl, glabrous, minute; flowers in a head; calyces ciliate.*—A shrub, a foot in height. Native of the Cape of Good Hope. Flowering from June to August. It is readily known by its white calyces, most distinctly ciliate. Introduced 1794.

4. *BLÆRIA ARTICULATA* (jointed stemmed *Blæria*). *Leaves four in a whorl, ovate, glabrous, shining.*—This is a distorted shrub, the stature of the Common Heath. Heads of flowers terminating, with white villous calyces. Corolla flesh coloured. Anthers very narrow, black. Native of the Cape. Flowering in June and July. Introduced 1795.

5. *BLÆRIA PURPUREA* (purple flowered *Blæria*). *Leaves four in a whorl, ovate, subciliated.*—It resembles the *articulata*, but in that the heads are nodding. The flowers are axillary, and of a purple colour. They appear in June and July. Introduced 1791.

CULTURE.—The species of this genus are all shrubs, inhabitants of the Cape of Good Hope; requiring the same shelter and treatment with other Cape plants in the dry stove; and may be increased by cuttings, which root readily in sand under a bell-glass. They deserve a place in every collection. A turfy peat and sand is the best soil for them.

BLAKEA (so named by Dr. P. Brown, after Mr. M. Blake of Antigua, a great promoter of useful knowledge, and a patron of the Doctor's Natural History of Jamaica).

Class Dodecandria Monogynia. Nat. Ord. *Melastomaceæ*.

The Characters are—*Sepals 6, inferior with a superior entire calyx; petals 6; capsule six-celled, many seeded.*

1. *BLAKEA TRINERVIA* (three-ribbed *Blakea*). Bot. Mag. t. 451. *Calyces two; leaves with three nerves, finely striated across beneath.*—It grows generally to the height of ten or fourteen feet, but rises always higher when it remains a climber, in which state it continues sometimes. It is certainly one of the most beautiful productions of America.

It supports itself for a time by the help of some neighbouring shrub or tree, but it grows gradually more robust, and at length acquires a pretty moderate stem, which divides into a thousand weakly declining branches, well supplied with an abundance of beautiful flowers, of a charming rose colour. Native of Jamaica, in cool moist shady places; flowering in July.

It cannot display itself to so great advantage in our stoves; but it flowers freely, and thrives well in a mixture of loam and peat, well supplied with water. Introduced 1798.

2. *BLAKEA QUINQUENERVIA* (five-nerved *Blakea*). *Leaves triple nerved*.—This tree grows to the height of sixteen feet. Leaves opposite, six or seven inches long. Peduncles three-flowered. Flowers the size of the *Pomgranate*, distinct, without any lower perianth. Upper perianth three or five-cleft, coriaceous, permanent; the receptacle streaked from the centre to the circumference. Petals about seven, ovate-oblong, inserted into the calyx, sessile, yellow without, white within, fleshy. Filaments twelve or fifteen, inserted into the calyx: anthers ovate compressed, parallel, bent, flattish at the back, shorter than the corolla. Style club-shaped, round, the length of the petals, bent down to the lower side of the corolla, out of the circle of the stamens; stigma capitate, streaked. Fruit a roundish, many-celled berry, crowned with the calyx, the disk concave, the ring notched, the centre umbilicate. Seeds minute. The fruit is of a yellow colour, and sapid.

Native of Surinam, where it was observed by Dalberg. Also of Guiana, where it flowers and fruits in May. Introduced 1820.

CULTURE.—The species of this genus are stoye plants, requiring a considerable degree of moisture. They thrive well in loam and peat, ripened cuttings root readily in sand in moist heat, with a hand-glass over them.

BLANDFORDIA (a name given by Sir J. E. Smith in honour of his Grace George Duke of Marlborough, at that time Marquis of Blandford, one of the most ardent botanists and cultivators that this country ever possessed in any rank of life.

A genus belonging to what Linnaeus terms the *Patrician* order, was judged peculiarly eligible for this purpose; nor

can any one be more distinct, few more beautiful).

Class Hexandria Monogynia. Nat. Ord. *Hemerocallidæ*.

The Characters are—*Flower tubular, withering, with a six-lobed mouth; stamens inserted on the tube; anthers fixed to a base like an extinguisher; ovary stalked; stigma simple; capsule three-partible; seeds in two rows, with a loose downy spur.*

1. *BLANDFORDIA NOBILIS* (scarlet *Blandfordia*). Bot. Mag. t. 2003. *Bractæas but half the length of the partial stalks while in flower; leaves narrow, linear*.—The root is woody and perennial. Leaves all radical, four or five inches long, scarcely half an inch broad, entire, smooth, coriaceous, tapering at the base into sheathing footstalks. Flower stalks radical, two or three feet high, erect, round, each bearing a very handsome corymbose cluster of drooping, scarlet flowers, yellow, and marked with green at the border, each near an inch and a half long, on a red partial stalk of the same length, at whose base are two unequal, opposite, tapering bractæas. Capsule pointed, twice the length of the permanent withered corolla.

This beautiful plant, native of the neighbourhood of Port Jackson, is a greenhouse perennial, flowering in July and August. Increased by seed planted in a mixture of sand, loam, and peat. Introduced 1803.

2. *BLANDFORDIA GRANDIFLORA* (large flowered *Blandfordia*). Bot. Reg. t. 924. *Bractæas as long as flower stalk; the inner much the shortest*.—An ornamental, hardy, greenhouse, herbaceous plant, distinguished from *B. nobilis* by the greater size of its flowers; by the colour of its leaves, which are bright yellowish green, not glaucous, and by the bractæas during flowering being as long as the pedicels. The scape attains to the height of two or three feet. Raceme many flowered, with solitary, bright orange-red flowers.

This superb plant is seen to great advantage in a conservatory, where it produces its flowers in the greatest profusion. It is a native of New Holland. Introduced 1824.

CULTURE.—The plants of this splendid genus are readily increased by seed; an equal mixture of loam, sand, and peat, is the most suitable soil for them.

BLECHNUM.

Class Cryptogamia Filices. Nat. Ord. Filices.

The Characters are—*Sori linear, continuous, (sometimes interrupted), contiguous to the mid-rib; indusium membranous, superficial, continuous, opening inwards.*

1. BLECHNUM BOREALE (northern Blechnum). Eng. Bot. t. 1159. *Fronde pinnated, smooth; pinnae linear, bluntish, entire, nearly equal at the base.*—A native of moist shady places, as well as of open barren and stony heaths, where its seeds are perfected in July and August. The root is perennial, black, and scaly. Fronds several, a foot or more in height, erect, of a deep green. Innumerable capsules form a brown line close to each rib. Each capsule is encompassed with a ring.

2. BLECHNUM AUSTRALE (Cape Blechnum). *Fronde pinnated; pinnae linear-lanceolate, mucronate, auricled at base, scabrous at edge.*—There are only two lines of fructification longitudinal, and distant both from the edge and rib. Native of the Cape. Introduced 1774.

3. BLECHNUM OCCIDENTALE (South American Blechnum). *Fronde pinnated; lower pinnae opposite, lanceolate, entire, subcordate at base, upper alternate, united.*—This species rises by a simple undivided stalk to the height of thirteen or eighteen inches. It is a native of the West Indian Islands, and the continent of South America. Introduced here about 1774.

4. BLECHNUM LONGIFOLIUM (long-leaved Blechnum). *Fronde pinnate; pinnae 5-7, linear-lanceolate, slightly falcate, acuminate, margin rough.*—Root creeping. Caudex eight to ten inches high. Frond the same length as the caudex; of a deep shining green. Fructifications forming a continued line on each side of the mid-rib. It was found by Humboldt growing in the opposite country of Caraccas in shaded stony places, at an elevation of three thousand feet.

CULTURE.—The first species only is a native of this country. The rest require the protection of the dry stove or conservatory. They are increased by parting the roots.

BLECHUM.

Class Didynamia Angiospermia. Nat. Ord. Acanthaceæ.

The Characters are—*Calyx five-parted, equal; corolla funnel-shaped; capsule about two-celled, two-valved; the segments of the crosswise dissepiment finally becoming loose; seeds many, with hooks.*

1. BLECHUM BROWNEI (dense spiked Blechnum). Slo. jam. t. 109. f. 1. *Leaves ovate, elliptical, somewhat toothed; spikes four-cornered; bractæas ovate, downy.*—An herbaceous, decumbent, branched perennial. Native of the West Indies; about two or three feet high, with opposite leaves, and white flowers of no great beauty, which are produced in June. Introduced 1780.

2. BLECHUM ANGUSTIPOLIUM (narrow leaved Blechnum). *Leaves linear-lanceolate; spikes oblong; bractæas ovate, hairy.*—An herbaceous perennial, a foot high, with tumid joints. Leaves smooth on both sides. Flowers small, blue. Native of the Caribbee Islands. Flowering from July to October. Introduced 1826.

CULTURE.—Increased by cuttings, which root readily in a mixture of loam and peat. They require to be kept in the bark-stove.

BLETIA (so named by the authors of the Flora Peruviana after Louis Blet, a Spanish Apothecary).

Class Gynandria Monandria. Nat. Ord. Orchideæ.

The Characters are—*Lip sessile, cucullate; sometimes spurred at the base; sepals 5, distinct; column separate; pollen-masses 8 or 4, 2-lobed.*

1. BLETIA TANKERVILLIÆ (Lady Tankerville's Bletia). Bot. Mag. t. 1994. *Lip spurred, undivided; spur short, leaves radical, ovate, lanceolate.*—This very beautiful plant is a native of China. The scape grows quite erect, three feet high, the spike of flowers extends to more than two feet. The splendidly contrasted colours of the flowers render it much admired. The inside of the calyx and petals is cinnamon-coloured, the outside of the most brilliant polished white; the nectary crimson. It is by no means a tender plant, and should be allowed a good deal of air, but will not flower well out of the stove. Propagated by separating its bulbs, by which it multiplies pretty fast. Flowers in March and April. Introduced 1778.

2. BLETIA VERECUNDA (tall Bletia). *Lip not spurred, ribs of the disk branched,*

forming a hood over the style. Furrows of the lip yellow. Native of the West Indies. It makes a beautiful appearance, flowering from January to May. Introduced 1733.

3. *BLETIA PALLIDA* (pale flowered Bletia). Bot. Cab. t. 629. *Leaves linear-lanceolate, plaited; sepals connivent, scape higher than leaves.*—The flower stem is about two feet in height, bearing twelve or more flowers, which open two or three at a time. The leaves are nearly a foot in length. It requires to be constantly preserved in the stove; where it will flower in the month of February, and possesses much beauty. Native of the West Indies. Introduced 1820.

4. *BLETIA HYACINTHINA* (hyacinthine Bletia). Bot. Mag. t. 1492. *Lip not spurred, beardless; pollen masses 4, two-lobed; stems leafy; flowers racemose.*—Native of China, of rather more humble growth than the *Florida*, from which it differs in having terminal, not radical flower stalks. The flowers too are a little larger, purplish rather than crimson. Petals and calyx exactly similar. Lip with four shallow curled lobes in front. Flowers from March to June. Introduced 1802.

5. *BLETIA WOODFORDII* (Woodford's Bletia). Bot. Mag. t. 2719. *Lip three lobed, involute; their margin waved and crenate.*—This fine species of Bletia is a native of Trinidad. The scape is two feet high or more. The flowers are large and grow in terminal racemes. Petals of a yellow green colour, lip white, lobes of a yellow brown. The flowers appear from May to August. Introduced 1820.

6. *BLETIA FLORIDA* (purple Bletia). *Lip not spurred; ribs of the disk simple; middle lobe somewhat cuneiform, lateral broader at end.*—Native of the warmest parts of the West Indies. Stalk somewhat branched, eighteen or nineteen inches high. Flowers an inch and a quarter long; petals and calyx leaves oblong, uniform. Disk of the lip yellow. The flowers appear in July and August. Introduced 1786.

BLIGHIA (named in honour of Capt. Bligh who first carried the Bread Fruit to the West Indies).

with a large *urillus*.

BLIGHIA SAPIDA (Akee Tree). Kon. an. bot. t. 1617.—Native of Africa, between the tropics, from whence it was transported to the West Indies in 1778. The fleshy tunic, or support of the seed is said to be a delicate article of cookery, resembling the white flesh of a chicken, like which it serves to make fricasees for West Indian epicures. The tree is large, of handsome growth, with abruptly pinnate, ample, smooth, entire leaves and copious, small, white flowers, in compound, axillary panicles; nectary a glandular notched ring, surrounding the base of the germen or its rudiment. Capsule elliptic-oblong, three-lobed, fleshy, variegated with red and yellow, about the size of a goose-egg. Seeds globular, as big as cherries, dark brown, polished, each half sunk in a white, turbinate, lobed and corrugated tunic, of the substance of firm suet, larger than the seed, and attached laterally to the central partition of each valve. Introduced 1793.

CULTURE.—Increased by ripened cuttings with their leaves on, which root well in sand under a hand-glass. The best soil to grow it in is a mixture of loam and peat.

BLIGHTS.

There is nothing so destructive to a fruit garden as blights; nor is there any thing in the business of gardening which requires more of our serious attention, than the endeavouring to prevent or guard against this great enemy of gardens.

1. Blights are often caused by a continued dry easterly wind for several days together, without the intervention of showers, or any morning dew, by which the perspiration in the tender blossoms is stopped, so that in a short time their colour is changed, and they wither and decay; and if it so happen that there is a long continuance of the same weather, it equally affects the tender leaves; for their perspiring matter is hereby thickened and rendered glutinous, closely adhering to the surface of the leaves, and becomes a proper nutriment to those small insects, which are always found preying upon the leaves and tender branches of fruit-

trees, whenever this blight happens; but it is not these insects which are the first cause of blights, as hath been imagined by some; though it must be allowed, that whenever these insects meet with such a proper food, they multiply exceedingly, and are instrumental in promoting the distemper; so that many times, when the season proves favourable to them, and no proper care has been taken to prevent their mischief, it is surprising to think how whole walls of trees have suffered by this infection.

The best remedy for this distemper, that I have yet known succeed, is, gently to wash and sprinkle over the trees, from time to time, with common water (that is, such as has not had any thing steeped in it); and the sooner this is performed (whenever we apprehend danger), the better; and if the young and tender shoots seem to be much infected, wash them with a woollen cloth, so as to clear them, if possible, from all this glutinous matter, that their respiration and perspiration may not be obstructed; and if we place some broad flat pans or tubs of water near the trees, that the vapours exhaled from the water may be received by the trees, it will keep their tender parts in a ductile state, and greatly help them; but whenever this operation of washing the trees are performed, it should be early in the day, that the moisture may be exhaled before the cold of the night comes on; especially if the nights are frosty: nor should it be done when the sun shines very hot upon the wall, which would be subject to scorch up the tender blossoms.

2. Another cause of blights in the spring is, sharp hoar-frosts, which are often succeeded by hot sun-shine in the day-time; this is the most sudden and certain destroyer of fruits that is known; for the cold of the night starves the tender parts of the blossoms, and the sun rising hot upon the walls before the moisture is dried from the blossoms (which being in small globules, collects the rays of the sun), a scalding heat is thereby acquired, which scorches the tender flowers, and other parts of plants.

The method to prevent this mischief is to cover the walls carefully with some canvass, or reeds, fastened so as not to be disturbed with the wind, and suffered to remain on during the night,

but taken off every day when the weather permits. Although this method is thought by some to be of little service, and may be really prejudicial, if the trees be too long covered, or incautiously exposed; yet, when this covering is conducted properly, it frequently proves a great protection to fruit-trees; and if the covering be fixed near the upper part of the wall, and be fastened to pulleys, so as to be drawn up or let down occasionally, the operation will be easy, and the success will sufficiently repay the trouble.

3. But there is another sort of blight that sometimes happens later in the spring, namely in April or May, which is often very destructive to orchards, and open plantations, against which we know not any remedy. This is called a fire blast, which in a few hours has not only destroyed the fruit and leaves, but many times parts of trees, and sometimes entire trees have been killed by it.

This is supposed to be effected by volumes of transparent flying vapours, which among the many forms they revolve into, may sometimes approach so near to an hemisphere or hemicylinder, either in their upper or lower surfaces, as thereby to make the beams of the sun converge enough to scorch the plants or trees they fall upon, in proportion to the greater or less convergency of the sun's rays.

Against this enemy to fruits there is no guard to our trees, nor any remedy to cure it: but as this more frequently happens in close plantations (where the stagnating vapours from the earth, and the plentiful perspirations from the trees, are pent in for want of a free air to dissipate and dispel them; which are often observed, in still weather, to ascend in so plentiful a manner, as to be seen by the naked eye, but especially with reflecting telescopes, so as to make a clear and distinct object become dim and tremulous), than in those that are planted at a greater distance, or are not surrounded with hills and woods; this directs us, in the first planting of kitchen-gardens and orchards, &c. that we should allow a greater distance between the trees, and to the choice of clear healthy situations, that the air may freely pass between the trees to dissipate those vapours before they are formed into such volumes, whereby the

circumambient air will be clear, and less subject to injuries; as also the fruits which are produced in this clearer air, will be much better tasted than those that are surrounded with a thick rancid air; for as fruits are often in a respiring state, they consequently, by imbibing a part of these vapours, are rendered crude and ill-tasted, which is often the case with a great part of our fruits in England.

4. But that blights are frequently no more than an inward weakness or distemper in trees, will evidently appear, if we consider how often it happens, that trees against the same wall, exposed to the same aspect, and equally enjoying the advantages of sun and air, with every other circumstance which might render them equally healthy, yet very often are observed to differ greatly in their strength and vigour; and as often we observe the weak trees to be continually blighted, when the vigorous ones, in the same situation shall escape very well; which must, therefore, in a great measure, be ascribed to their healthy constitution. This weakness therefore in trees, must proceed either from a want of a sufficient supply of nourishment to maintain them in perfect vigour, or from some ill qualities in the soil where they grow, or perhaps, from some bad quality in the stock, or inbred distemper of the buds or scions, which they had imbibed from their mother tree, or from mismanagement in the pruning, &c. all which are productive of distempers in trees, and of which they are with difficulty cured. Now, if this is occasioned by a weakness in the tree, we should endeavour to trace out the true cause: first, whether it has been occasioned by ill-management in the pruning, which is too often the case: for how common is it to observe Peach trees trained up to the full length of their branches every year, so as to be carried to the top of the wall in a few years after planting, when at the same time the shoots for bearing have been so weak, as scarcely to have strength to produce their flowers, but this being the utmost of their vigour, the blossoms fall off, and many times the branches decay, either the greatest part of their length, or quite down to the place where they are produced; and this, whenever it happens to be the case, is ascribed to a blight.

Others there are, who suffer their trees to grow just as they are naturally disposed, during the summer season, without stopping shoots, or disburdening their trees of luxuriant branches; by which means two, three, or four shoots shall exhaust the greatest part of the nourishment of the trees all the summer; which shoots, at the winter pruning, are entirely cut out; so that the strength of the tree was employed only in nourishing useless branches, while the fruit branches are thereby rendered so weak, as not to be able to preserve themselves. The remedies to this evil has been explained in the article of Pruning Peach trees, &c. under AMYGDALUS.

But if the weakness of the tree proceeds from an inbred distemper, it is the better way to remove the tree at first: and after renewing your earth, plant a new one in its place.

Or if your soil be a hot burning gravel or sand, in which your Peach trees are planted, you will generally find this will be constantly their case, after their roots have got beyond the earth of your borders; for which reason, it is much more advisable to dig them up, and plant Grapes, Figs, Apricots, or any other sort of fruit, which may do well in such a soil, rather than to be annually disappointed of your hopes; for, by a variety of experiments, it has been found, that Apricots attract and imbibe moisture with a much greater force than Peaches and Nectarines; and consequently, are better able to attract the nutritive particles from the earth, than the others, which require to be planted in a generous soil, capable of affording them a sufficiency of nourishment without much difficulty; and it is in such places we often see Peaches do wonders; especially if assisted by art; but as for the Vine and Fig tree, they perspire very slowly, and are very often in an imbibing state (so that a great part of that fine racy flavour, with which their fruits abound when planted in a dry soil, is probably owing to those refined aerial principles, which are collected when in a state of respiration): and therefore as these trees delight not in drawing much watery nourishment from the earth, so they will much better succeed in such soil, than in one that is more generous: we should therefore always endeavour to suit the

particular sorts of fruits to the nature of our soil, and not pretend to have all sorts of fruit good in the same.

BLITUM.

Class Monandria Digynia. Nat. Ord. *Chenopodaceæ*.

The Characters are—*Calyx trifid; corolla 0; seed 1, immersed in a berried calyx.*

1. *BLITUM CAPITATUM* (berry headed strawberry Blite). *Heads in terminal spikes.*—An ornamental annual, with leaves resembling those of spinach, and stalk rising, in gardens about two and a half feet high; but in a wild state upright, and only about a foot high. Flowers in the upper part issuing in small heads at every joint, and terminated by a cluster of the same; when the flowers are past, these heads swell to the size of wood strawberries, and when ripe have the same appearance, full of a purple juice, which stains the hands, and formerly much used in cookery, for colouring puddings, &c. Seed black when ripe. It is commonly called strawberry blite, or strawberry spinach. A native of Switzerland, the Tyrol, Spain, &c. Was cultivated by Parkinson in 1633.

2. *BLITUM VIRGATUM* (slender strawberry Blite). *Heads lateral, scattered.*—Seldom growing more than one foot high, with smaller leaves than the former. Flowers produced from the axils, almost the whole length of the stalk; small and collected into little heads, smaller than the first, and not so deeply coloured but of the same shape. A native of the South of France, Spain, Italy, and Tartary. Its berries are produced from June to September; in their taste they have nothing to recommend them; though not pleasant they are harmless. It affects a dry soil, and open situation; in such there is no necessity to give any particular direction for its cultivation, as it comes up readily from seed spontaneously scattered, so much so as sometimes to prove a troublesome weed. Introduced 1680.

3. *BLITUM CHENOPODIODES* (goose-foot strawberry Blite). *Heads axillary, small, not juicy; stems very branching.*—A low plant resembling *chenopodium*. A native of Tartary. Flowering from May to August. Introduced 1797.

CULTURE.—All are annual plants, which drop their seeds, that will produce plentifully the following spring;

or if the seeds of any one of them be sown in March or April, upon a bed of common earth, in an open situation, the plants will come up in a month or six weeks, and remaining in the same place, will require no other care besides being kept from weeds, and thinned out to the distance of six or eight inches apart; and in July the plants will begin to show their berries, which will make a pretty appearance.

By many they are transplanted into the borders of the flower garden, and by others planted in pots, so as to be ready for removal into the court-yard, or for being placed upon low walls for ornament. When these plants are designed to be removed, they should be transplanted before they shoot up their flower-stems, for they will not bear transplanting afterwards; and when planted in pots, they must be watered in dry weather; and as the flower-stems advance, they should be supported by sticks.

BLUMEA (in honour of C. L. Blume, M. D., author of several works on Java plants).

Class Monadelphia Polyandria. Nat. Ord. *Ternstroemiaceæ*.

The Characters are—*Calyx five-parted, unequal; petals 5, obovate, free; anthers almost sessile, disposed in a ring around the style, which is five-cleft at the apex; capsules five-celled, many seeded.*

BLUMEA JAVANICA (Java Blumea). *Leaves oblong, serrulated, smooth.*—A tree thirty feet high. Native of Java. The flowers are produced on three flowered peduncles. They are large, and of a yellow colour. It requires the warmth of a stove; and may be increased by ripened cuttings planted in sand under a hand-glass, in heat.

BLUMENBACHIA (named in compliment to the celebrated naturalist, Professor Blumenbach).

Class Polyadelphia Polyandria. Nat. Ord. *Loasææ*.

The Characters are—*Tube of calyx spirally twisted; petals 10, five inner ones scale formed, each scale inclosing two sterile filaments; fertile stamens in five bundles; fruit dividing into ten parts at the base.*

1. *BLUMENBACHIA INSIGNIS* (showy Blumenbachia). *Lower leaves seven-lobed; upper ones deeply bipinnate.*—A trailing plant; stem very much

branched; branches spreading in all directions, thickly clothed with rigid bristles, which inflict a slight sting when touched, similar to that of a nettle. Peduncles one-flowered. Flowers white; the whole back of the petals densely pubescent. Flowers from July to November. Native of Chili. Introduced 1826.

2. *BLUMENBACHIA GRANDIFLORA* (great-flowered Blumenbachia). Juss. An. Mus. t. 3. f. 1. *Leaves opposite, petiolate, acute, somewhat cordate at the base.*—A native of Peru. Pedicels one-flowered. Flowers yellow. Introduced 1829.

CULTURE.—The species of this genus are elegant annual plants, with very showy flowers. They thrive best in a rich light soil. They would probably survive as perennials if protected in the green-house, or in frames, in winter. The seeds should be sown early in the spring in the open ground, and the plants so raised will flower and produce seed the same season.

BOCCONIA.

Class Dodecandria Monogynia. Nat. Ord. *Papaveraceæ*.

The Characters are—*Calyx two-leaved; corolla 0, style bifid; capsule two-valved, 1 seeded.*

1. *BOCCONIA FRUTESCENS* (tree celandine Bocconia). Bot. Cab. t. 83. *Leaves oblong, sinuated.*—This is a shrub rising to the height of ten or twelve feet, with a strait trunk, as large as a man's arm, covered with a white smooth bark, and branched towards the top. The trunk is hollow, filled with a pith like the *Elder*, abounding in a thick yellow juice like *Argemone* and *Celandine*. Branches brittle, unequal, marked with scars from the fallen leaves. Leaves from six or seven inches to a foot in length, smooth, ash-coloured-tomentose beneath; petioles roundish pubescent. Racemes terminating, panicle, a foot long, diffused, nodding. Peduncles one-flowered. Germ ovate, compressed, glaucous. Native of Mexico and the West-India islands. The juice is acrid, and is used in the West-Indies to take off tetters and warts. It was cultivated in 1739, by Mr. Miller.

CULTURE.—It is propagated by seeds, which should be sown in a pot filled with light fresh earth, early in the spring, and plunged into a hot-bed of tanners' bark, observing to water it now

and then gently, otherwise the seeds will not grow. When the plants are come up, they should be each transplanted into separate small pots filled with light sandy earth, and plunged into the hot-bed again, observing to shade the glasses in the heat of the day, until the plants have taken root. They must be also gently watered, but it should be done sparingly while they are young; for their stems being very tender, and full of juice, will rot, if they receive too much moisture; but after their stems are become woody, they will require it often, especially in hot weather; when also they should have a large share of air, by raising the glasses of the hot-bed. The plants, in two months after transplanting, will have filled these small pots with their roots; therefore they should be shaken out of them, and planted into pots one size larger, filled with light fresh earth, and plunged into the bark-stove, where they should have a good share of fresh air in warm weather.

BÆBERA (so named by Willdenow after Bæbor a learned Russian botanist).

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Involucrum double; outer many leaved; inner eight-leaved; receptacle naked, pappus naked.*

BÆBERA CHRYSANTHEMOIDES (dwarf Bæbera). *Leaves pinnated; leaflets pinnatifid toothed.*—A branched herb, twelve or eighteen inches high, with the habit of an *anthemist*, besprinkled with glandular pellucid dots, full of a fætid bitter fluid. Flowers of a golden yellow, with eight small rays; leaves narrow. This plant grows in every part of America, but especially in the Kingdom of Santa Fe, where it is called *Ruda* on account of its offensive smell. It is sometimes employed as a vermifuge, and affords a tolerably durable yellow dye. The flowers appear in October. Introduced 1821.

CULTURE.—These plants are readily increased by seed sown in the early part of spring, in a mixture of loam and peat; they require no other care but to keep them clear from weeds.

BÆHMERIA.

Class Monœcia Tetrandria. Nat. Ord. *Urticæ*.

The Characters are—*Male, calyx four-parted; corolla 0; nut 0. Female, calyx 0; corolla 0; style 1; seed 1.*

1. *BOERHMERIA CYLINDRICA* (cylindrical Bœhmeria). *Leaves opposite, ovate-oblong, acuminate, toothed, smooth; flowers dioecous; male spikes clustered, interruptedly; female cylindrical.*—This is an annual plant, with a lucid herbaceous stalk, dividing into several branches. The leaves are placed on pretty long foot-stalks. Flowers in single catkins which are not divided. Native of North America, and Jamaica. Introduced 1759.

2. *BOERHMERIA RAMIFLORA* (branch-flowering Bœhmeria). *Leaves alternate, broadly lanceolate, acuminate, serrated, rugose; flowers clustered, axillary, and lateral, monœcious; males three androus.*—This is a shrub eight feet in height, with long branches. Leaves sickle-shaped, rugged, on very short petioles, hanging forward, placed alternately towards the ends of the twigs, very different in size, being two inches and a foot in length on the same twig. Male flowers small, yellowish, numerous, aggregate, on the leafless old branches. Females whitish on the younger twigs to the very ends. Native of Jamaica, Martinico, and other islands of the West Indies.

3. *BOERHMERIA CAUDATA* (tailed Bœhmeria). *The leaves opposite, ovate, acute, serrate; racemes very long, pendulous; flowers dioecous; stem suffrutescent.*—This is a shrub growing to the height of ten or twelve feet. The leaves are very broad. It is frequent in the cooler mountains of Liguanea, in Jamaica. Browne calls it the nettle tree.

CULTURE.—The species of this genus are plants of little beauty. They are however easily increased either by cuttings or by suckers, which root readily in a mixture of sand and loam.

BOERHAAVIA (so named by M. Vailant, in honour of the famous Boerhaave, professor of botany, &c. in the University of Leyden).

Class Monandria Monogynia. Nat. Ord. *Nyctagineæ*.

The Characters are—*Calyx one-leaved, oblong-conical inclosing the seed; corolla plaited on the end of the calyx.*

1. *BOERHAAVIA ERECTA* (upright Hog-weed). *Stem four-cornered, smooth; joints clammy; flowers panicled; leaves angular, dotted with black beneath.*—Stem two feet high. At each

joint a pair of ovate pointed leaves, whitish underneath, on foot-stalks an inch in length. At these joints, which are far asunder, come out also small side branches, growing erect; they, as well as the stem, are terminated by loose panicles of flesh-coloured flowers, succeeded by oblong glutinous seeds. This was discovered by Dr. Houstoun, at La Vera Cruz, in 1731. It grows also in the Society Isles.

2. *BOERHAAVIA DIFFUSA* (spreading Hog-weed). *Stem round, pubescent; flowers in capitate corymbs.*—This sends out many diffused stalks, a foot and a half or two feet long, with small leaves at each joint. The flowers grow very scatteringly, upon long branching peduncles from the axils and at the end of the branches; they are of a pale red colour, and are succeeded by oblong glutinous seeds. Native of both Indies. Mr. Miller received the seeds from Dr. Houstoun; but it had been cultivated in the Royal Garden at Hampton Court in 1698.

3. *BOERHAAVIA HIRSUTA* (scarlet trailing Hog-weed). *Stems roundish, hairy; leaves ovate, acute, sub-repand; flowers in heads diandrous.*—This sends out many trailing hairy stalks, which divide into smaller branches. At the axils come out naked peduncles, sustaining small close heads of scarlet flowers, which are very fugacious, seldom standing more than half a day before their petals drop; they are succeeded by short oblong seed. It grows naturally in Jamaica; and it was sent from thence to Mr. Miller by Dr. Houstoun.

4. *BOERHAAVIA SCANDENS* (climbing Hog-weed). *Stem climbing; leaves all cordate; flowers in umbels diandrous.*—This sends out several stalks from the root, which divide into many branches, and trail over whatever plants grow near them, rising to the height of five or six feet. Leaves by pairs at each joint on long foot-stalks; of the colour and consistence of those of the greater chick-weed. The flowers grow in loose umbels at the extremities of the branches; they are yellow, and are succeeded by small, viscous, oblong seeds. Native of Jamaica. Introduced 1691.

CULTURE.—They are propagated by seed, which must be sown on a hot-bed in the spring, and when the plants are

It to be removed, they should be each planted in a small pot and plunged into the hot-bed, and treated as other tender exotic plants.

When they are grown too tall to remain under a common frame, a plant or two of each sort should be placed in the stove; the others may be turned out of the pots, and planted in a warm border, where, if the season proves warm, they will perfect their seeds. Those in the stove will always ripen their seed in autumn.

BOLETUS, in botany, touch-wood, a genus of the order of fungi, belonging to the cryptogamia class of plants. It is characterized by Linnæus as a *horizontal fungus, porous or pumoked with lobes underneath*. Sprengel enumerates 124 species, of which the following are the most remarkable.

1. *Boletus bovinus*, or cow touch-wood, is frequent in woods and pastures. It is generally of a brown colour, though sometimes it is tawny, yellowish brown, reddish brown, deep red, purple, or greenish brown. The flesh is yellow, white, or reddish. The young plants are eaten in Italy, and esteemed a great delicacy. The Germans also account them a dainty, calling them *gombas* and *brat-bulz*. Cows, deer, sheep, and swine, will feed upon this and other boleti, but are sometimes greatly disordered by them. In cows and other cattle they have been known to create bloody urine, nauseous milk, swellings of the abdomen, inflammations of the bowels, stoppages, diarrhœas, and death. In sheep they are said to bring on a schirrhous liver, a cough, a general wasting, and dropsy. *Scarabs, dermestes*, and many other insects feed upon and breed in them abundantly.

2. *Boletus igniarius*, or touch-wood, is frequent on the trunks of old trees of all kinds, especially ash. It consists of a very hard woody substance, in shape like a horse's hoof; and grows of various sizes, from a man's fist to that of his head, and larger. The upper side is smooth, but uneven, distinguished near the rim by elevated zones of different colours, brown, grey, tawny, &c. The flesh is of a tawny brown colour, extremely hard and tough. This fungus is made use of in Germany and some parts of England for timber. The Germans boil it in strong ley, dry it,

and boil it again in solution of saltpetre. The Laplanders burn it about their habitations, in order to keep off a species of the gad-fly, which is fatal to the young rein-deer. It has been used to stop the bleeding of the vessels after amputations. (Phil. Trans. vol. xlviii. p. 2). For this purpose the hard outer part is cut off, and the soft inner substance is beaten with a hammer to make it still softer. It is best when gathered in August or September.

3. *Boletus pini laricis*, or agaric of the shops, grows on old larch trees. This fungus is an irregular spongy substance, extremely light, and of an uniform snowy whiteness; except the cortical part, which is usually taken off before the agaric is brought into the shop.

It cuts freely with a knife, and readily crumbles betwixt the fingers into a powder. It has no remarkable smell; its taste is at first sweetish, but on chewing for a short time, it proves acrid, bitter, and nauseous. Agaric was formerly in great esteem as a cathartic, but it is now rejected both by the London and Edinburgh colleges, though it still retains a place in most of the foreign pharmacopœias. Its infusion in water is yellowish, sweet tasted, and reddens vegetable blues. It contains muriate of potash, sulphate of lime, and sulphate of potash. Water boiled in agaric becomes gelatinous on cooling; and ammonia is exhaled by the addition of lime. Resin of a yellow colour, with a bitter sour taste, may be extracted from it by alcohol. It yields benzoic acid by Scheele's process. The strong acids act with energy on agaric, and the nitric evolves oxalic acid.

4. *Boletus suberosus*, or white cork touch-wood, grows commonly on the trunks of birch and willow trees. It grows sessile and horizontal; its figure is semicircular; the upper side convex, the under nearly plain; of various sizes, from that of an ass's hoof to a peck measure. The upper surface is quite white, generally covered with a short strong down, but sometimes smooth. The internal substance is thick, white, tough, light, and spongy like cork; and is sometimes cut and shaped by the country people in Scotland for corks.

Boo properly signifies a quagmire, covered with grass, but not solid enough

to support the weight of the body; in which sense, it differs only from marshes or fens, as a part from the whole: some even restrain the term bog to quagmires pent up between two hills; whereas fens lie in champaign and low countries, where the descent is very small. To drain boggy lands, a good method is, to make trenches of a sufficient depth to carry off the moisture; and if these are partly filled with rough stones and then covered with thorn bushes and straw, to keep the earth from filling up their interstices, a stratum of good earth and turf may be laid over them all; the cavities among the stones will give passage to the water, and the turf will grow at top as if nothing had been done.

BOLDOA.

Class Triandria Monogynia, Nat. Ord. *Nyctagineæ*.

The Characters are—*Calyx tubular, limb four-toothed, plicate; corolla 0; stamens hypogynous; style filiform; stigma simple.*

BOLDOA LANCEOLATA (lance-leaved Boldoa). H. et. B. Pl. æ. t. 44. *Leaves oblong, attenuate; corymbs axillary.*—Plant surmentose. The branches alternate, deep red, covered with a very short whitish down, extremely viscid. The flowers are produced in corymbs at the extremity of the young branches, each having a separate peduncle. They are of red colour, and appear from May to August. Fruit a single oval berry, black, enclosed in the persistent calyx. A native of Mexico growing near the sea shore. It delights in a dry and sandy soil and requires to be kept in the green-house in winter, but to be well supplied with air in mild weather, and forms from the elegantly disposed arrangement of its numerous vivid red flowers, a distinguished ornament, during the long period of its efflorescence. Introduced 1824.

BOLEUM.

Class Tetradynamia Siliculosa. Nat. Ord. *Cruciferae*.

The Characters are—*Larger stamens connate; style slender, somewhat conical at the top of a beak formed silicle.*

BOLEUM ASPERUM (rough Boleum). Desv. t. 6. *Leaves alternate, oblong lower ones somewhat divided.*—A pretty little suffruticose, erect, branched shrub, a foot in height; hispid from stiff hairs, saccines erect, elongated; pedicels very

short, lower ones bracteate. The flowers are erect cream-coloured, or yellowish. Seeds one or two in each cell. It is well adapted for ornamenting rock work, enlivening it with its pretty blossoms in the months of April and May. May be increased by cuttings which root readily, if planted under a hand-glass. Introduced 1824.

BOLTONIA (so named in honour of Mr. James Bolton of Halifax, author of the History of British Ferns, and of Fungusses growing about Halifax).

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositæ*.

The Characters are—*Receptacle favose, hemispherical; pappus toothed, awned, somewhat two-horned; rays numerous; involucrem imbricated.*

1. BOLTONIA ASTEROIDES (starwort flowered Boltonia). Bot. Mag. t. 2554. *Leaves all entire.*—The plant is that of an Aster, with the leaves of *Lactuca Scariola*. Stem upright, two feet high. Panicle thin, stiffish, with one-flowered peduncles. It differs from *B. glastifolia* in the leaves being of a brighter green, with no admixture of blackish tinge. The plant is much taller and stouter, and the flowers grow in more branched and closer panicles; the ray white, and disk yellow; in *glastifolia* the ray is of a deep purple upon its first appearance, and when fully blown remain of a flesh colour. It is a hardy perennial. Native of North America. Flowers in September and October. Introduced 1758.

2. BOLTONICA GLASTIFOLIA (glaucous leaved Boltonia). Bot. Mag. t. 2391. *Lower leaves all serrated.*—A pretty perennial, a foot and a half high; flowering in September. It is a native of North America. Introduced 1758.

CULTURE.—These plants may be readily increased by dividing the roots and planting them in a mixture of loam and peat. They require little care, and when in flower make a very pretty appearance.

BOMBAX (from *Bombyz*, one of the Greek names for cotton).

Class Monadelphia Polyandria. Nat. Ord. *Bombacæ*.

The Characters are—*Calyx five-lobed; stamens five or many; capsule woody, five-celled; seeds woolly; receptacle five-cornered.*

1. BOMBAX CEIBA (five leaved silk cotton tree). *Stem prickly; leaves pal-*

mate; leaflets 5; fruit turbinate, concave at end.—It arrives at a great size in both Indies, being one of the tallest trees in those countries; but the wood is very light, and not much valued, except for canoes. Their trunks are so large as, when hollowed, to make very large ones. In Columbus's first voyage it is related, that a canoe was seen at the island of Cuba, made of one of these trees, which was ninety-five palms long, of a proportional width, and capable of containing one hundred and fifty men; and some modern writers have affirmed, that there are trees of the silk cotton now growing in the West Indies, so large as not to be fathomed by sixteen men, and so tall that an arrow cannot be shot to their top.

The canoes now made in the West Indies from this tree frequently carry from fifteen to twenty hogsheads of sugar, from six to twelve hundred weight each; the average about twenty-five tons burthen. When sawn into boards, and then well saturated with lime-water, the wood bears exposure to the weather many years; it is also formed into laths for roofs, curing-pots, and hogshead heading.

When the tree decays, it becomes a nest for the Macaco beetle, the caterpillar of which, gutted and fried, is esteemed by many persons one of the greatest delicacies.

The down which is inclosed in the seed-vessels is seldom used, except by the poorer inhabitants to stuff pillows or chairs; and it is generally thought unwholesome to lie upon.

The flowers are large, and of a pale red colour.

It was cultivated in 1692, in the royal garden at Hampton Court.

2. **BOMBAX HEPTAPHYLLUM** (seven leaved Silk-cotton tree). Plum. t. 188. f. 4. *Stem prickly; leaves palmate; leaflets 7, entire, acuminate; fruit oblong, blunt.*—This grows fifty feet high before it branches, and is eighteen feet in thickness. The bark has smooth, shining, sharp prickles, which fall off on the body, but remain on the branches, so as to prevent monkeys from climbing the tree. It grows every where in Malabar, bearing fruit at sixteen years growth, in February and March, till it is two years of age and upwards. It is also a native of America. The flowers are of a crimson colour. Istro. 1699.

3. **BOMBAX MALABARICUM** (Malabar Silk-cotton tree). Rox. Cor. t. 247. *Leaves palmate, with five-seven oblong, entire, acuminate leaflets; fruit oblong, blunt.*—This is one of the largest as well as the most common tree in the East Indies. The wood is white, light, and spongy, fit for very few purposes. In India the wool of the seeds is used to stuff beds and pillows with, and to put between the folds of quilted cloth. It flowers towards the end of winter, when the tree is totally destitute of leaves. The great number of very large bright red flowers, with which it is then covered, makes it remarkably conspicuous at a very great distance.

CULTURE.—Silk cotton is propagated by seeds, which must be sown on a hot-bed in the spring; if the seeds are good, the plants will appear in a month, and will be strong enough to transplant in a month after, when they should be each planted in a small pot, filled with fresh loamy earth, and plunged into a moderate hot-bed of tanners' bark, being careful to shade them from the sun till they have taken fresh root; after which they should have a large share of air admitted to them when the weather is warm, to prevent their being drawn up weak; they must also be frequently refreshed with water, which must not be given in large quantities. In this bed they may remain till autumn (provided there be room for the plants under the glasses) but if the heat of the bed decline, the tan should be stirred up, and fresh added to it; and if the plants have filled the pots with their roots, they should be shifted into pots a little larger; but there must be care taken not to over-pot them, for nothing is more injurious to these plants, than to be put into large pots, in which they will never thrive. In the autumn they must be removed to the bark-stove, where they must constantly remain, being too tender to thrive in this country in any other situation. In winter they must have but little wet, especially if they cast their leaves; but in the summer they should be frequently refreshed with water, and in warm weather must have plenty of fresh air admitted to them. With this management the plants will make great progress, and in a few years will reach the glass on the top of the stove.

The plants make an agreeable variety

in a large stove where they have room to grow, their leaves having a different appearance from most other plants; but as they are several years old before they flower in the countries where they grow naturally, there is little hope of their producing them in England. Indeed it is not likely they ever will, as most of them attain a height of fifty or sixty feet before they attempt to flower in their own countries.

BONATEA.

Class Gynandria Monogynia. Nat. Ord. *Orchideæ*.

The Characters are—*Sepals arched, ringent; labellum five-parted, calcarate; column winged on both sides.*

BONATEA SPECIOSA (handsome Bonatea). Bot. Cab. t. 234. *Leaves radical, oblong, nervose*.—A very rare plant. Native of the Cape of Good Hope. Few flowers are more remarkable in their structure, or contain more curious appendages than this. The flowers at times are fragrant, and last a considerable period, commencing in March. Introduced 1820. It requires to be kept in the stove, and may be increased sparingly by its tuberous roots. The soil should be sandy peat and loam.

BONNAYA.

Class Diandria Monogynia. Nat. Ord. *Scrophularinæ*.

The Characters are—*Calyx 5, partitus sub bracteatus; corolla 2, labiata 1-3; stamina 2, fertilia, conniventia, sterilia 0; capsula linearis vel subbulata bi-locularis, bi-valvis polysperma, placenta libera.* (Link).

BONNAYA VERONICÆFOLIA (speedwell leaved Bonnaya). Rox. Cor. t. 154. *Leaves opposite, sessile, decussated, oblong, glandulous, finely serrated*.—The stems several, creeping. Branches erect, four to eight inches long, smooth. Raceme terminal. Flowers opposite, decussated, violet-coloured. It is a native of the East Indies in moist places. Flowering from July to September. Introduced 1798.

CULTURE.—Bonnaya is a genus of annual and biennial plants, that require a considerable degree of moisture, and to be kept constantly in the stove. They are propagated by seeds, sown in a boggy kind of earth.

BONNETIA (in honour of C. Bonnet, a French naturalist).

Class Polyandria Monogynia. Nat. Ord. *Ternstroemiaceæ*.

The Characters are—*Calyx of five sepals imbricate; style trifid at the apex; capsule three-celled, three-valved, many seeded; seeds linear, winged at both ends.*

1. **BONNETIA ANCEPS** (two edged Bonnetia). Mart. t. 100. *B. Leaves obovate-oblong, on short pedicles, smooth*.—A tree sixteen feet high, found by Martius growing in sandy places in Brazil. It flowers in September. The petals are white, mixed with rose-colour. Introduced 1830.

2. **BONNETIA STRICTA** (straight Bonnetia). *Leaves alternate, nearly sessile, obovate, coriaceous, shining*.—A shrub seven feet high. Peduncles axillary, terminal, three-flowered. Native of marshy places, between Cape Frio and Lago Feca. Brazils.

CULTURE.—The species of this genus make an elegant appearance. They thrive well in a mixture of peat and loam. Increased by ripened cuttings, planted in sand under a hand-glass, in a moderate heat.

BONTIA.

Class Didynamia Angiospermia. Nat. Ord. *Myoporinæ*.

The Characters are—*Calyx five-parted; corolla two-lipped, with an oblong tube; the lower lip three-parted, revolute; drupe ovate, one-seeded, oblique at end.*

BONTIA DAPHNOIDES (Barbadoes Bontia). *Leaves alternate; peduncles one-flowered*.—The leaves are thickish, rather stiff, very smooth, green on both sides. Flowers yellowish, with a line of dusky purple along the middle of the lower lip. Birds grow fat upon the fruits, but unless the entrails are taken out as soon as the bird is killed, it becomes too bitter to eat. Flowers in June. Introduced 1690.

CULTURE.—It is greatly cultivated in the gardens at Barbadoes, for making hedges, than which there is not a more proper plant for those hot countries, it being an evergreen, and of quick growth. I have been informed, that from cuttings (planted in the rainy season, when they have immediately taken root) there has been a complete hedge, four or five feet high, in eighteen months. And as this will very well bear cutting, it is formed into a very close thick hedge, which makes a beautiful appearance. In England it may be raised from seeds, which should

be sown on a hot-bed early in the spring, that the plants may acquire strength before winter. When the plants are come up, they must be transplanted out, each into a separate half-penny pot filled with light fresh earth, and plunged into a moderate hot-bed of tanners' bark, observing to water and shade them until they have taken root; after which they must have a large share of air in warm weather, and be often refreshed with water. In winter they must be placed in the stove, where they should have a moderate degree of warmth, and but little water during that season. In summer they must have a great share of air, but will not do well if exposed abroad, especially in cold summers; so that they should remain in the stove among plants which require a great share of air, which may be admitted by opening the glasses in very hot weather. With this management, these plants will produce flowers and fruit in three or four years from seed. They may also be propagated by cuttings, which should be planted in the summer. They must be put into pots filled with light rich earth, and plunged into a moderate hot-bed, observing to water and shade them until they have taken root; after which they must be treated as hath been directed for the seedling plants. These plants being evergreen, and growing in a pyramidal form, make a pretty variety in the stove amongst other exotic plants.

BORAGO.

Class Pentandria Monogynia. Nat. Ord. *Boraginæ*.

The Characters are—*Calyx five-parted; corolla rotate, with acute segments; orifice crowned; filament conniving; seeds rounded, closed at base, rugose, inserted lengthwise into an excavated receptacle.*

1. *BORAGO OFFICINALIS* (common Borage). Eng. Bot. t. 36. *Leaves ovate, the lower stalked, all alternate; calyx spreading; peduncles terminal, many flowered.*—According to Pliny, the ancient Romans called it *Buglossus*, from the greek *βουλωστος*, because the leaf is like an ox tongue. It was also called *Euphrasymon*; for when put into a cup of wine, it made those who drank of it merry.

It is said to have been originally brought from Aleppo; but it grows so

freely in this country, that many authors deem it an indigenous plant.

Parkinson states that it grew in Kent.

The whole herb is succulent, and very mucilaginous, having a very faint smell when bruised. Its flowers are of the number of the four cordial ones of the shops, and it has been recommended as a medicine of great efficacy in malignant and pestilential fevers, and against the bite of poisonous animals. It has always been esteemed as an excellent cooling cordial in all febrile cases, and may be justly regarded as a proper simple to be used in an over-heated state of the blood; it is generally administered in decoctions and infusions with other cooling medicines.

Coles, and M. Valmont Bomare, say, these flowers have no virtue when dry, therefore it is better in winter to use the roots, which being fresh, possess all the qualities of the blossoms. Water distilled from both the leaves and flowers of this plant, as well as a conserve of the blossoms, has been formerly kept in the shops; but these are very little regarded in modern practice, especially in England, where most diseases (says Brown) proceed rather from inaction and the viscosity of the juices.

By the experiments of M. Margraaf, in 1747, it appears that the juice of this plant yields a true nitre. The clarified juice of borage evaporated by a water-bath, in a consistency of thick honey becomes saponaceous, and will dissolve in spirit of wine. The juice of the borage, distilled at a naked fire, bloats itself out considerably, and yields an insipid phlegm, which is soon followed by an alkaline volatile spirit, very penetrating, and then an empyreumatic, fetid, and heavy oil; there remains a very light coal, which is reduced with some difficulty into ashes. These give an alkali, such as the most part of vegetables furnish: the coal itself, before the incineration, furnishes a great deal of nitre, some little marine salt, and an alkaline salt of a deliquescent nature.

M. Bouquet says, it is clear, that of all these principles, the juice of the borage contains only the phlegm, the oily part, the nitre, the marine salt, the fixed alkali, and the earthy part. As to the volatile alkali, it is the produce of the fire, which has formed it at the expense of the fixed alkali, and of the

oil; because this produce, though very volatile, only passes after the phlegm, and when the decomposition is already advanced; for, operate how you may to separate the salts contained in the borage, you will never find volatile alkali.

This plant divides thick and vulgar humours, attenuates the blood, re-establishes secretions and excretions, and is useful in all illnesses where it is essential to avoid hot remedies, as in pleurisy, peripneumony, &c. It is esteemed diuretic, emollient, and expectorant.

Lord Bacon observes that "the leaf of the borage hath an excellent spirit, to repress the fuliginous vapour of dusky melancholy, and so to cure madness. But nevertheless, if the leaf be infused long, it yieldeth forth but a raw substance of no virtue; but if the borage stay a small time, and be often changed with fresh, it will make a sovereign drink for melancholy passions."

There is an old verse on this plant, which says

"Ego Borage gaudia semper ago,"
which has been thus paraphrased
"I Borage bring courage."

Gerard informs us that in Queen Elizabeth's time, both the leaves and flowers of this plant were eaten in salad, "to exhilarate and make the mind glad." "There is," says he, "also many things made of them; used everywhere for the comfort of the heart, for the driving away of sorrow, and increasing the joy of the mind. Sirrupe made of the flowers of the borage, comforteth the heart, purgeth melancholie, quieteth the phreneticke or lunaticke person. The leaves eaten raw do ingender good blood, and when boiled in honey and water they cure hoarseness."

Very light surely, says an ingenious author, were those sorrows that could be so driven away! Yet borage flowers are at least innocent, which is more than can be said of many other general remedies for care.

With all the advantages which this herb is said to possess, it is now nearly neglected, and but seldom used in England either in salads or as a pot-herb. It is principally cultivated in our gardens to make cool tankards, which are a pleasant and wholesome summer drink. The common colour of its flow-

ers are blue; but it varies to flesh colour and white. Flowering from May to August.

The whole plant is rough, with white stiff prickly hairs.

This is a biennial plant, which, if permitted to scatter its seeds, the plants will come up in plenty without care; the seeds may also be sown either in spring or autumn, but the latter season is preferable, on a spot of open ground where the plants are designed to remain; when the plants have obtained a little strength, the ground should be hoed to destroy the weeds, and the plants must be cut up where they are too near each other, leaving them eight or ten inches asunder. After this they will require no farther care, unless the weeds should come up again; then the ground should be a second time hoed over to destroy them, which, if well performed, and in dry weather, will clear the ground from weeds, so it will require no more cleaning till the borage is decayed. The plants which are raised in the autumn will flower in May, but those which are raised in the spring will not flower till June; so that where a continuation of the flowers are required, there should be a second sowing in the spring, about a month after the first; but this should be on a shady border, and if the season should prove dry, the ground must be watered frequently, to bring up the plants; this latter sowing will continue flowering till the end of summer.

2. BORAGO ORIENTALIS (oriental Borage). Bot. Reg. t. 288. *Leaves cordate, stalked; peduncles many flowered; stamens exerted, villous.*—This is a perennial plant, with thick fleshy roots, spreading under the surface. Root-leaves many, oblong, heart-shaped, on long hairy foot-stalks. Flower stem more than two feet high, having at the joints a single, small, sessile leaf: the upper part branches out into several small foot-stalks, which are terminated by loose panicles of flowers, of a pale blue colour; the petal is turned back, so that the connected anthers and style are left naked. The seeds are smaller than those of common borage. It flowers in March, and the seeds ripen in May. When the flower-stalk first appears, the flowers seem collected into a close spike, some of which often spread

open before the stalk is six inches high, but as the stalks advance, they divide into many loose spikes. Native of the country about Constantinople.

Is easily propagated by the root, which may be parted in the autumn; it should have a dry soil and a warm situation, for as the flower-stalks appear early in the spring, when they are much exposed they are often killed by the frost; if it be planted in dry rubbish, it will not grow so luxuriant, nor be in danger of suffering by frost.

3. *BORAGO LAXIFLORA* (bell flowered Borage). Bot. Mag. t. 1798. *Leaves alternate, oblong, sessile; peduncles axillary, one-flowered; corolla campanulate, nodding.*—This plant differs from the other species of borage, by its bell shaped corolla. Its stem is weak, assurgent, very hispid, with stiff shining deflexed hairs. Peduncles axillary, solitary, one-flowered, longer than the leaf, recurved when in fruit. A native of Corsica. Flowering in July. Introduced 1818.

4. *BORAGO CRETICA* (Cretan Borage). Flor. Græc. t. 176. *Leaves ovate, obtuse.*—The root is perennial, fusiform, brown. Stem erect, eighteen inches high, branching, somewhat red, leafy. Leaves alternate. Racemes terminal, many flowered. Flowers pendulous, white. Stamina rose-coloured. Style white. A native of Greece. Flowering in June and July. Introduced 1823.

5. *BORAGO CRASSIFOLIA* (thick leaved Borage). Vent. cels. 100. *Glaucous; stem smooth; leaves decurrent, rough above; segments of corolla linear, lanceolate, spreading, unequal.*—An ornamental plant. Stem two feet high. Flowers pink. They appear in June and July. Native of Persia. Introduced 1822.

CULTURE.—The perennial species of this genus are easily propagated by cuttings, planted in a mixture of sandy loam.

BORASSUS.

Class *Dicæcia Hexandria*. Nat. Ord. *Palmae*.

The Characters are—*Calyx three-leaved; corolla hypocrateriform, with a three-parted limb; female calyx eight-nine leaved, imbricated; corolla 0; style 0; drupe with three stones.*

BORASSUS FLABELLIFORMIS (fan-leaved Borassus). Rox. Cor. t. 71, 72. *Fronds palmated, plaited, cucullate;*

stalks serrated.—The trunk is covered with a very dark-coloured bark; the wood is of a dark brownish red, and has a soft pith in the middle. Fronds decussate on the top of the trunk; stipe near six feet in length, flat and somewhat hollow, and rough with spines along the edges; below near a span in breadth, above not more than a palm. The leaf part is very large, wide, and folded like a fan or umbrella, for which purpose it is used; at the edges of the folds there are rough, prominent ribs, in front it is gashed, and the texture is close and thick. The male and female flowers are on different trees, which have been considered as distinct species.

This tree is twenty-five or thirty feet in height, two feet thick at bottom, and one at top. The fruit is the size of a child's head. A wine and a sugar are made from the sap of this palm. It is a native of Ceylon, the coast of Comandel, Java, &c.

When the seeds are young they are a pleasant, cooling jelly, much eaten by the natives, and the addition of a little sugar and rose water makes them extremely palatable: the pulp of the ripe fruit is also eaten.

The leaves are universally used for writing upon, with an iron style or bodkin. They are also employed for thatching houses, for making small baskets, mats, &c. and are formed into large fans called *vissaries*. Introduced 1771.

CULTURE.—This palm may be increased by suckers, planted in a rich mould. It requires to be kept constantly in the stove.

BORBONIA (in honour of G. de Bourbon, Duke of Orleans, son of Henry IV. of France, a great lover of botany).

Class *Monadelphica Decandria*. Nat. Ord. *Leguminosæ*.

The Characters are—*Stigma emarginate; calyx acuminato, spiny; legume mucronate.*

1. *BORBONIA TRINEURVIA* (three-nerved Borbonia). Plu. t. 297. f. 4. *Leaves lanceolate, three-nerved, entire, sessile.*—It has strong stalks, three to four feet high. It has stiff lanceolate leaves, with three longitudinal nerves, as have also the branches, almost their whole length, and they are placed closer together than in *crenata*. The flowers are produced at the extremities of the

branches, each on a separate peduncle; they are of the same shape and colour with the two following, but larger. Native of the Cape of Good Hope, flowering in July and August. Introduced 1759.

2. *BORBONIA CRENATA* (notch leaved Borbonia). Bot. Mag. t. 274. *Leaves cordate, many nerved, toothletted*.—It is a small shrubby plant, rarely exceeding the height of three feet, producing its flowers in a small cluster on the summits of the branches; these are of a yellow colour, and have nothing about them peculiarly singular or beautiful. It is the foliage alone which renders this plant desirable in a collection. It flowers from June to August, and in favourable seasons ripens its seeds, by which the plant is usually propagated. Introduced 1774.

3. *BORBONIA CORDATA* (heart leaved Borbonia). *Leaves cordate, many nerved, entire*.—The stalks are slender, and covered with white bark. Leaves stem-clasping, and terminated by sharp points, like those of *Ruscus*, or *Butcher's Broom*). The flowers are produced in small clusters at the ends of the branches, and are of a yellow colour. Calyx five-cleft, nearly regular, hirsute, with spiny segments. The whole corolla is tomentose on the outside. Introduced 1759.

4. *BORBONIA RUSCIFOLIA* (butcher's broom Borbonia). Bot. Mag. t. 2128. *Leaves rigid, pointed, pungent, oblong, dense*.—A shrub two to four feet in height, with yellow flowers. They are produced in July and August. It requires the protection of the greenhouse. Propagated by seeds or cuttings. Introduced 1790.

5. *BORBONIA LÆVIGATA* (polished Borbonia). Bot. Cab. t. 247. *Leaves ovate, cordate, acuminate, pungent, stem hirsute*.—The branches round, subvillose towards the top. Leave sessile, pointed. Umbellules terminating, on very short peduncles. Involucre four-leaved, ovate, concave, erect. Pedicels in fours, shorter than the involucre. Calyx bell-shaped, flat at the base, five-cleft, with the upper cleft smaller than the others, acute, shorter than the corolla, which is yellow. Germ hirsute. Within the calyx are some nectareous scales. It flowers abundantly in the summer months, and when well grown, is a very pretty

green-house plant. As it becomes old, the lower branches grow naked and unsightly, which renders it necessary to renew the plant occasionally by cuttings, which succeeds pretty readily; the soil should be sandy loam.

6. *BORBONIA LANCEOLATA* (many nerved Borbonia). *Leaves lanceolate, many nerved, entire*.—Stem a foot high, smooth, round, and ash-coloured; divided into a few branches, which are red whilst young. Leaves stem-clasping, long, narrow, ending in a sharp point. The flowers come out from between the leaves at the ends of the branches, in small clusters: they are yellow, and shaped like those of broom. It flowers in August and September; and was cultivated in 1748, by Mr. Miller.

CULTURE.—As these plants do not perfect their seeds in this country, they are with difficulty propagated here. The only method by which I have yet succeeded, has been by laying down their young shoots; but these are commonly two years before they put out roots fit to be separated from the old plant. In laying these down, the joint which is laid in the ground should be slit upward, as it is practised in laying Carnations, and the bark of the tongue at bottom taken off. The best time is the beginning of September; and the shoots most proper for this purpose are those which come out immediately, or very near the root, and are of the same year's growth, not only from their situation being near the ground, and thereby better adapted for laying, but these are also more apt to put out roots than any of the upper branches.

But where good seeds can be procured, that is the more eligible method of propagating the plants; for those raised from the seeds make the straightest plants, and are quicker of growth. They should be sown in pots filled with light loamy earth, as soon as they are received; if it happens in the autumn, the pots should be plunged into an old bed of tanners' bark, under a frame, where they may remain all the winter, being careful that they are secured from frost, and have not much wet. In the spring, the pots should be plunged into a hot-bed, which will bring up the plants in five or six weeks. When these are fit to remove, they should be each planted into a separate small pot filled with the like loamy earth, and

plunged into a moderate hot-bed, observing to shade them until they have taken fresh root, as also to refresh them with water, as they may require it. After this they must be by degrees inured to the open air, into which they should be removed in June, and placed in a sheltered situation.

BORDERS.

The use of these in a garden is to bind and inclose parterres, to prevent their being injured by walking on them; these are commonly rendered very ornamental by means of the flowers, shrubs, &c. that are planted in them.

These ought to be laid with a rising in the middle, because, if they are flat, they are not agreeable to the eye.

As for their breadth, five or six feet are often allowed for the largest, and four for the lesser.

"Borders are of four sorts: those are the most common, that are continued about parterres without any interruption, and are wrought with a gentle rising in the middle, like an ass's back, and planted with flowers.

"The second sort of borders is such as are cut into compartments, at convenient distances, by small passages; and being also raised in the middle, as before mentioned, are likewise set off with flowers.

- "The third sort is such as are laid even and flat without flowers, having only a verge of grass in the middle, being edged with two small paths, raked smooth and sanded. These are sometimes garnished with flowering shrubs, and flowers of large growth, or with vases and flower-pots, placed regularly along the middle of the verge of grass.

"The fourth sort is quite plain, and only sanded, as in the parterres of an orangery, and is filled with cases ranged in regular order along those borders which are edged with Box on the sides next to the walks, and on the other, with verges and grass-work next the parterre.

"Borders are either made straight, circular, or in cants, and are turned into knots, scrolls, and other compartments.

"Florists also make borders either along walks, or detached, and in these they raise their finest and choicest flowers. These are frequently encompassed with border-boards painted green, which make them look exceedingly neat.

"But, in large parterres, this is not to

be expected; since, if they be stocked with flowers succeeding one another in their several seasons, it is sufficient, so that nothing appears bare and naked.

"It is usual to discontinue the borders at the ends next to the house, that the embroidery and rise of the parterre may not be hidden by the shrubs and flowering plants, and that the design may be better judged of.

"Since the modern way of gardening has been introduced in England, all the French taste of parterres, scroll-borders, and fret-work in Box, has been justly banished our gardens; therefore I have only mentioned them here, to expose the taste of those architect-gardeners, who have no idea of the noble simplicity of an open lawn of grass, properly bounded by plantations; but, instead of this, divide the part of the garden near the house into various forms of borders edged with Box, with sand, shell, or gravel-walks leading about them, by which the ground is cut into many angles, scrolls, &c. which is very hurtful to the eyes of a judicious person: therefore, where flowers are desired, there may be borders continued round the extent of the lawn, immediately before the plantations of shrubs; which, if properly planted with hardy flowers to succeed each other, will afford a much more pleasing prospect than the stiff borders made in scrolls and compartments, after the French manner, can possibly do.

"These borders may be made six or eight feet wide, in proportion to the extent of the garden, and size of the lawn: for a small lawn should not have very broad borders, nor ought a large lawn to be bounded by small borders; so that a due proportion should be always observed in the laying out of gardens."

BORONIA (named after J. Borone, an Italian servant of Dr. Sibthorp, who perished from an accident at Athens. He collected specimens of many of those plants which are figured in the *Flora Græca*).

Class Octandria Monogynia. Nat. Ord. *Rutaceæ*.

The Characters are—*Calyx* four-parted; *petals* four, marcescent; *stamens* 8, unequal, free; *anthers* seated on the shortest threads which terminate the filaments; *fruit* of four two-valved carpels.

1. *BORONIA PINNATA* (pinnate leaved Boronia). Bot. Cab. t. 473. *Leaflets two-three-four pairs, linear, acute, quite smooth.*—The *B. pinnata* is a very elegant shrub, which spreads wide and grows about two feet high, being covered with a profusion of sweet scented pink blossoms during great part of the spring and summer, which remain long in beauty. It is a native of New Holland; propagated with difficulty by cuttings, requiring a dry situation in the green-house, and flourishes most in bright sandy peat. Introduced 1794.

2. *BORONIA TETRANDBRA* (tetrandrous Boronia). Lab. Nov. Hol. t. 125. *Leaflets four-five pairs, linear, obtuse, smooth.*—A shrub varying from one to four feet in height, branches pilose; pedicels 1-flowered. Flowers pale purple. Introduced 1824.

3. *BORONIA ALATA* (winged petioled Boronia). Swt. fl. Austr. t. 48. *Leaflets three-five pairs, crenate, revolute, pilose on the nerves beneath.*—A strong-growing, handsome, upright, evergreen shrub, very much branched; with the branches opposite. Flowers red tipped with green. It is a native of the west coast of New Holland, flowering from April to September; and thriving well in a mixture of one third light sandy loam, and two thirds peat, and requires the protection of a green-house in winter. Introduced 1824.

4. *BORONIA SERRULATA* (rose scented Boronia). Bot. Reg. t. 842. *Leaves trapeziform, acute, serrulate in front, smooth, full of glandular dots.*—A dwarf, densely leafy, evergreen shrub. Flowers terminal, crowded, from four to twelve. They are very fragrant, and of a bright rose-colour. It is deserving a place in every collection, both for its beauty and the delightful fragrance of its flowers, which has attained for it the name of the "Native Rose" in New South Wales, where it is very common, especially about Port Jackson; flowering from February to June. Introduced 1816.

5. *BORONIA DENTICULATA* (tooth-leaved Boronia). Bot. Reg. t. 1090. *Leaves linear, retuse, toothletted, terminated by a small point.*—An elegant green-house plant, from two to six feet in height, with smoothish, round branches. Flowers in terminal corymbs, rose-coloured. They make a very handsome appearance during the period

of their continuance, which is from March to August. Native of New Holland. Introduced 1823.

6. *BORONIA CRENULATA* (crenulate leaved Boronia). *Leaves obovate, mucronulate, crenulated; pedicels axillary, terminal.*—At first sight this appears to be only a variety of *serrulata*, the leaves especially being but about one third the size of those of that species; but on examination of the flowers, sufficient marks of distinction are to be found. Even the leaves differ essentially in obovate, obtuse with a small point, and crenulated, not serrated, about the extremity. The flower-stalks are axillary as well as terminal, all situated towards the top of the branches, and all simple and single flowered. Flowers small, red, with a fringed calyx. It varies from one to four feet in height. Flowering from April to August. Native of New Holland at King George's Sound.

7. *BORONIA POLYGALIFOLIA* (milk-wort leaved Boronia). *Leaves linear-lanceolate, quite entire; peduncles axillary, solitary, one-flowered.*—What is chiefly remarkable in this species, besides its being herbaceous, is the diversity in the situation of the leaves, some of which, and consequently the flowers, are alternate, others opposite, or even three together, on different branches from the same root. The flowers are red, and appear from March to July. Introduced 1824.

CULTURE.—The species of this genus are small, elegant green-house shrubs. Natives of New South Wales, deserving a place in every collection. They thrive best in sandy peat, and the pots should be well drained with potsherds. Cuttings taken off at a joint, and planted in a pot of sand, with a bell-glass set over them, and afterwards planted out in a frame, will strike root.

BORERIA (named after W. Borrer, F. L. S. &c. one of our first English botanists).

Class Tetrandria Monogymia. Nat. Ord. Rubiaceae.

The Characters are—*Limbs of calyx two-four toothed; corolla funnel-shaped, four-lobed; stamens 4, exserted; stigma bifid or undivided; capsule two-celled, crowned.*

1. *BORERIA PUSILLA* (small Borreria). *Leaves linear-lanceolate, acute, glabrous, pale beneath.*—A small plant. Native of Nipank. The stem is herba-

ceous, slender, four to six inches high, branched; heads of flowers small, two or three of them axillary, and one terminal. Flowers white.

2. *BORRERIA SCANDENS* (climbing *Borreria*). Sloan. *Hib. Jam.* t. 28. f. 4. A. *Stem shrubby at the base, ascending, weak, rather scandent, branched; branches tetragonal, striated, rather scabrous along the angles; leaves ovate, glabrous, tapering into the petioles a little.*—It climbs up the trunks of trees in its native country of Guadaloupe, similar to Ivy. The heads of flowers are small, terminal, white, girded by four leaves. Capsule oval, glabrous. Introduced 1824.

CULTURE.—The species of this genus are numerous. They are herbs or subshrubs, nearly all natives of the hotter parts of America; and of very easy culture. They have however no particular beauty to recommend them. The perennial and shrubby kinds are readily increased by cuttings, which strike root freely in light soil. The annual sorts require the same treatment as other tender annuals.

BORYA (named by M. Labillardiere, in honour of the distinguished botanical traveller, M. Bory de St. Vincent).

Class Hexandria Monogynia. Nat. Ord. *Asphodeleæ*.

The Characters are—*Spatha of two unequal, sheathing, permanent valves; corolla of one petal, funnel shaped, withering; limb in six deep equal segments; stamens inserted into its contracted throat; style filiform; stigma obtuse; capsule superior, of three cells and three valves, with central partitions; seeds several.*

BORYA NITIDA (shining *Borya*). Lab. Nov. Hol. t. 107. *Stem much branched, taking root below, with simple polished fibres; flower-stalks shorter than the ascending branches.*—The plant is about a span high, and except the want of downy radicles, seems calculated to confine the blowing sands of its dreary country, like our *carex arenaria*, &c. The stem is clothed with very crowded acerose, pointed leaves. Flower-stalks solitary, terminal, simple. Head nearly globular, encompassed with a few short leafy bracteas. Scales of the calyx smooth, membranous, the outer one sheathing the inner, which is narrower, and embraces the tube of the corolla. Native of New Holland. Intro. 1816.

CULTURE.—The species of this genus consists of perennial herbs, of a harsh dry texture. They are readily increased by dividing the roots, planting them in sand, with a bell-glass over them.

BOSCIA (in honour of L. Bosc, long time professor of agriculture in the Jardin des Plantes, Paris, and author of several works).

Class Polyandria Monogynia. Nat. Ord. *Capparideæ*.

The Characters are—*Sepals 4; petals 0; stamens 12-20, inserted in the short torus; berry stipitate, globose, one-seeded.*

BOSCIA SENEGALENSIS (Senegal *Boscia*). Lam. Ill. t. 395. f. 2. *Leaves alternate, elliptical, entire, coriaceous.*—An unarmed shrub, five feet high, with small white corymbose flowers. Leaves two inches long. Pedicels unequal, one-flowered. Fruit a small, globular berry, one-celled, one-seeded. Native of Senegal. Introduced 1824.

CULTURE.—It is increased readily by cuttings, which root freely in a pot of sand, and placed under a hand-glass in heat. A soil composed of equal portions of loam, peat, and rotten dung, is the most suitable to grow them in.

BOSEA (from Bosc a senator of Leipzig).

Class Pentandria Digynia. Nat. Ord. *Chenopodeæ*.

The Characters are—*Calyx five-leaved; corolla 0; berry one-seeded.*

BOSEA YERVAMORA (Golden root tree). Sloan. *Jam.* t. 153. f. 3.—It is a pretty strong woody shrub, with a stem as large as a middling person's leg; the branches come out very irregularly, and make considerable shoots in summer, which should be shortened every spring, to preserve the heads of the plants in any tolerable order; these branches retain their leaves till towards the spring, when they fall off, and new leaves are produced soon after.

Bark reddish-brown, smooth; wood white. Leaves two inches long, and one and a half broad, roundish, broader at the base, blunt at the end, white underneath, on short petioles; ribs purple. The flowers come out of the ends of the twigs, on alternate pedicels, at the base of which is a stipule. Calyx purplish, six-leaved. Seed black.

It is a native of the Canary Islands, whence it was first brought into England, and cultivated by Mr. Miller be-

fore 1728. It has also been found since in some of the British West India islands.

It may be propagated by cuttings in the spring; and the plants must be housed in winter.

BOSSIAEA (in honour of M. Bossieu Lamartiniere, a French botanist, who accompanied the unfortunate La Peyrouse round the world).

Class Monadelphica Decandria. Nat. Ord. *Leguminosae*.

The Characters are—*Calyx five-cleft, bilabiate; stamens monadelphous; legume compressed, pedicellate, many seeded, with the margins thickened on both sides; seeds strophiolate.*

1. **BOSSIAEA SCOLOPENDRIA** (plank-plant Bossiaea). Bot. Rep. t. 191. *Leaflets toothed, with the teeth bearing the flowers; keel naked.*—A hardy greenhouse shrub, from three to four feet high. Flowering early in summer. The winged branches, in a manner proliferous, and bearing handsome red and yellow, stalked, solitary flowers, from their numerous alternate teeth, give this shrub a very singular appearance. It must be planted in very sandy peat earth, and not much watered in winter, as too much wet is apt to destroy it. The young branches, which in the old plant appear much more like leaves, are very tender; but in time become as tough as leather, and are almost equally pliable. Native of New Holland, on the eastern coast. Introduced 1792.

2. **BOSSIAEA ENSATA** (sword stemmed Bossiaea). Swt. fl. Aust. t. 51. *Keel fringed.*—A low bushy shrub, with many rigid branches, which have scarcely any vestiges of leaves; at first these branches are quite flat, but after two or three years, they gradually become round. Flowers yellow, with the back and base of the vexillum of a brownish-orange purple colour, and with the keel brownish purple. Native of New Holland. Flowering from April to June. Introduced 1822.

3. **BOSSIAEA LINOPHYLLA** (narrow leaved Bossiaea). Bot. Cab. 174. *Branches compressed, leafy; leaves linear, with incurved margins.*—A pretty little green-house shrub, with delicate flexible branches, covered towards their extremities with beautiful small blossoms of an orange colour, streaked with red, and having a green eye. Flowers in May and June. Introduced 1803.

4. **BOSSIAEA HETEROPHYLLA** (various leaved Bossiaea). Bot. Mag. t. 1144. *Leaves obovate, elliptical, or linear, flat; legume of many cells, with spongy transverse dissepiments.*—A branched bushy shrub. Flowering most part of the year. The branches, though nearly flat, are not dilated, nor are they either toothed or denudated. The leaves are variable in figure, but on full grown plants usually linear, alternate, on short stalks. Flowers axillary, solitary, stalked, large, yellow, with a crimson keel, very ornamental. Introduced 1792.

5. **BOSSIAEA MICROPHYLLA** (little heart leaved Bossiaea). Bot. Reg. t. 656. *Branches round, leafy, spinous pointed; leaves cuneiform, obcordate, glabrous.*—It is a beautiful plant, from its numerous flowers, which are prettily variegated with yellow, purple, and red. The leaves are shorter than the flowers, veiny, and very abundant. The tips of the branches finally become spinous. Flowers from May to August. Introduced 1803.

6. **BOSSIAEA CORDIFOLIA** (heart leaved Bossiaea). *Leaves cordate, acute, spinose, mucronate.*—A dwarf erect bushy evergreen shrub. Flowers solitary, yellow, with a purple circle at the base, and a dark purple keel. They are fragrant, the scent resembling *ulae Europæus*. It grows to the height of three feet, and when in blossom is entirely covered with flowers. It is a very desirable plant for a green-house or conservatory. Flowering in June. Introduced 1824.

7. **BOSSIAEA RHOMBIFOLIA** (rhomb-leaved Bossiaea). *Leaves rhomboidal-orbicular, somewhat emarginate and mucronate; legume on a long stipe, falcate.*—A hardy green-house evergreen shrub. Flowers axillary, solitary, yellow with a purple keel. They appear from April to June, and make a handsome appearance. Introduced 1820.

8. **BOSSIAEA CINEREA** (sharp leaved Bossiaea). *Leaves ovate-lanceolate, scabrous above, and pubescent beneath, with recurved margins.*—A small bushy shrub, with numerous, solitary, axillary flowers, representing as they are placed along the branches, long spike-like leafy racemes. It flowers from May to July. Introduced 1803.

9. **BOSSIAEA PROSTRATA** (procumbent

Bossiaea). Bot. Mag. t. 1493. *Branches filiform, leafy, stem procumbent, leaves oval, glabrous; stipules shorter than the petioles; legume 1-seeded.*—A prostrate green-house shrub. Flowering in June and July. Introduced 1805.

CULTURE.—This beautiful genus, according to Sweet, "thrives best in an equal mixture of sandy loam and peat; if not very sandy, some sand must be added to it to have the plants in health. The pots must be well drained with broken potsherds, as nothing injures them more than too much water. Cuttings, not too ripe, will strike root if planted in sand under a bell-glass, not too close together, as they are apt to damp; when rooted, they must be potted off in little pots and kept in a close frame, and inured to the air by degrees."

BOSWELLIA (in memory of the late Dr. John Boswell of Edinburgh).

Class Decandria Monogynia. Nat. Ord. *Burseriaceae*.

The Characters are—*Flowers hermaphrodite, calyx five-toothed; petals 5, disk cup shaped crenated, stamiferous; stamens 10, style crowned by a capitate stigma, capsule trigonal, three-valved, three-celled, seeds solitary in the cells, girded by a membrane.*

1. **BOSWELLIA SERRATA** (Olibanum yielding Boswellia). *Leaves pinnate; leaflets serrated, downy; racemes axillary, simple.*—It is a lofty tree, indigenous to the mountains of central India, where it is known under the name of *Sali*. The foliage is crowded at the extremity of the branches. The flowers, which are produced in simple axillary racemes shorter than the leaves, are numerous, small, of a pale pink colour, accompanied with minute bracteas. It was formerly conjectured, on the authority of Linnæus, that the Olibanum of commerce was the product of the *Juniperus lycia*; but this opinion appears to be erroneous, as Mr. Colebrook has satisfactorily proved that the *Boswellia serrata* affords the resinous gum in question, that comes from India.

Olibanum is chiefly collected in India; but it is imported in casks and chests from the Levant. It distils from incisions made in the bark of the tree during the summer months. It is the *frankincense* of the ancients, and in the early ages, it was much used as incense in sacrifices; and in modern times, the diffusions of its vapour around the

altar still forms part of the ceremonies of the Greek and Roman Catholic Churches. Olibanum is in the form of semi-transparent masses or tears of a pale-yellowish or pink colour, solid, hard, and brittle. It has a bitterish acid taste, and when chewed, sticks to the teeth, and renders the saliva milky. When heated, it burns brilliantly, and diffuses an agreeable odour. Introduced 1816.

2. **BOSWELLIA GLABRA** (smooth Boswellia). Rox. Cor. t. 207. *Leaflets broad, lanceolate, blunt, smooth, serrated; racemes aggregate.*—The trunk is erect, seventy feet high, bark firm, pretty thick, and covered with a greenish ash-coloured, tender pellicle. Branches few in proportion to the size of the tree. Leaves unequally pinnate, six to twelve inches long. Racemes terminal. Flowers numerous, small, white. It is a native of the highest mountains on the coast of Coromandel, where its leaves are deciduous about the end of the rains in October. The wood is hard, heavy, and durable. From wounds made in the bark, a large quantity of resin exudes, which soon becomes hard and brittle, and is often used as a substitute for pitch. The finer species of this resin are frequently burnt, instead of common incense (Benzoin), in the temples of the natives. Introduced 1823.

CULTURE.—The species of this genus thrive well in a mixture of loam, peat, and sand. They may be increased by ripened cuttings, which take root readily in sand under a hand-glass in heat.

BOTANY (from *Botany*, Greek, an herb or plant) formerly implied a knowledge of the nature, uses, and cultivation of plants. In our accounts of the different genera, we have endeavoured to combine these three objects. But as a modern science, botany chiefly applies to the classification of plants; or that systematic arrangement by which, from general marks or characters, the botanist is enabled, first to trace the class, next the order, then the genus, and last of all the species, to which any plant he meets with belongs.

Various systems have been invented for the classification of the vegetable tribes; but that of Linnæus, as the simplest and most decisive, has superseded them all. It is founded on the sexual system, or that which supposes all plants to have male and female parts

of generation; a system which there is every reason to believe physiologically true, but which in that view will be more properly treated of under the article **PHYSIOLOGY OF PLANTS**.

SECT. I.—Of the parts of plants.

The principal outlines of a plant are thus delineated by Linnæus:—

A plant consists of a *root, trunk, leaves, props, fructification, and inflorescence*, to which may be added the *habit*.

1. The *root* consists of two parts, viz. the *caudex* and the *radicula*, distinguished according to shape, direction, duration, &c.

1. *Caudex*, the stump, is the body or knob of the root, from which the trunk and branches ascend, and the fibrous roots descend, and in different plants is either solid, bulbous, or tuberous. Solid, as in trees, shrubs, and many of the herbs. Bulbous is explained under **HYBERNACULUM**. Tuberous knobs are also solid and hard, containing one or more embryos or eyes. They are either only one knob, as *turnip, carrot, &c.* containing only one eye at the top; or consist of many knobs connected together by slender fibres, as in *potatoes, Jerusalem artichokes, &c.* each containing many eyes disposed over the surface; and are either pitted, when the eyes lie inward, as in *potatoes, &c.* or tuberculated, containing the eyes outward, as in *Jerusalem artichokes, &c.* In tuberous knobs, the fibres or stringy parts issue from every part of the surface, which is an essential difference from bulbous knobs, where they are confined to the caudex of the bulb only, and are the true and genuine roots, the bulb itself being only a large bud under ground. Those tuberous knobs with only one eye, differ as to duration, but are in general biennial; those with many eyes are perennial; both seem to be produced by the nutriment of the stem-like buds, and not by the fibrous roots, for the stem is first formed and becomes strong, and as it grows to maturity, the tuberous knobs increase.

2. *Radicula*, a little root, is the string or fibrous part of the root, descending from the caudex: it is really the principal and essential part of every root, and by which the nourishment is drawn from the earth for the support of the plant.

11. The *trunk* rises immediately from the caudex, and produces the leaves, flowers, and fruit. It is either *herbaceous, shrubby, or arborescent*; and is distinguished according to its shape, substance, surface, &c. as follows:—

1. *Caulis*, a stalk or stem, is the main trunk which elevates the leaves and fructification, and is applied to trees, shrubs, and herbs. It is denominated simple when it does not divide, and compound when it is divided into branches.

2. *Culmus*, a straw or haulm, is the proper trunk of grasses, and also elevates both the leaves and fructification. It is sometimes jointed, and sometimes not: it is also sometimes round and sometimes angular.

3. *Scapus*, a stalk, is an herbaceous trunk which elevates the fructification, but not the leaves; that is, it is a stalk proceeding immediately from the root, and terminated by the flowers, as in *narcissus, hyacinth, &c.*

4. *Stipes*, a trunk, used by Linnæus for the trunk of mushrooms, as also for that slender thread or footstalk which elevates the feathery or hairy down with which some seeds are furnished, and connects it with the seeds.

111. The *leaves* are either *simple* or *compound*, and are distinguished by their figure, situation, insertion, number, divisions, &c.

1. A *simple leaf* is such as adheres to the branch singly, or whose footstalk is terminated by a single expansion, not parted to the middle rib, and is determined by its shape, surface, and divisions.

2. A *compound leaf* is such whose footstalk is furnished with several separate simple expansions, or whose divisions extend to the middle rib, now called a common petiole or footstalk, supporting several lobes or little simple leaves, of which the compound leaf consists. They are distinguished by shape, &c. and the form by which they are attached to the common footstalk, as palmated, winged, feathered, &c. Sometimes leaves are twice or more compounded, which divisions admit of many modifications, and give rise to as great variety of terms. It may sometimes be difficult, at first sight, to know a common footstalk to a compound leaf from a branch; but a common footstalk, where it issues from the branch, is

either flat or hollow on one side, and convex on the other; whereas branches are alike on both sides, whether round, flat, or angular: again, buds are never found at the angles formed by the lobes of a compound leaf with the footstalk, but at the angles formed by the footstalk of the whole compound leaf and the stem; and it may always be certainly distinguished by its falling off with the little leaves which it supports. The manner or place in which leaves are attached to the plant, is called the determination of leaves, and is distinguished by several terms, according to number, disposition, insertion, figure, &c. (For the different leaves, see plates).

IV. The *proprs, fulcra*, a term used to express those external parts which strengthen, support, or defend, the plants on which they are found, or serve to facilitate some necessary secretion, are as follow:—

1. *Petiolus*, the footstalk or support of a leaf.

2. *Pedunculus*, the footstalk or support of a flower.

3. *Stipula*, haulm or husk, a sort of scale or small leaf stationed on most plants, (when present) on each side the base of the footstalk of leaves and flowers, at the first appearance, for the purpose of support. They are placed either single or double, and sometimes on the inside, as in the *fig* and *mulberry*; or on the outside, as in the *birch*, *lime*, and papilionaceous flowers. They are also either sitting, extended downwards, or sheathing along the stem, as in the *plane* tree. As to duration, they sometimes fall before the leaves, and sometimes are equally persistent. They often afford a good distinction for the species.

4. *Cirrhus*, a clasper or tendril, is the fine spiral string or fibre by which plants fasten themselves to some other body for support. They are sometimes placed opposite to the leaves; sometimes at the side of the footstalks of the leaves; sometimes they issue from the leaves themselves; and sometimes they put out roots, as in *ivy*, &c.

5. *Pubes*, a term applied to the hair, down, wool, beard, bristles, glands, and several other appearances on different parts of plants, serving the double purpose of defence and vessels of secretion.

6. *Arma*, the defensive weapons of plants, as thorns, prickles, &c.

7. *Bractææ*, the floral leaves, mean not only those leaves situated on the stalk nearest to the lower parts of the flower, but those which sometimes terminate the flower-stalk, being composed of large bractææ, resembling a bush of hair. They are then called bractææ comosæ, as in *crown-imperial*, *lavender*, and some species of *sage*.

V. The *fructification*, or mode of fruit-bearing, consists of the calyx, corolla, stamina, pistillum, pericarpium, semina, and receptaculum, which are afterwards explained.

VI. The *inflorescence*, or mode by which flowers are joined to their several peduncles, whether common or partial.

i. A *flower*, in the sexual system, has a very different signification from the same term of former botanists; for if the antheræ and stigma are present, though the calyx, corolla, filaments of the stamina, and style of the pistillum, be wanting, it is still a flower; and if all the parts are present, it is a complete flower. The seed also constitutes the fruit, whether there is a pericarpium or not.

ii. *Complete flowers* are either *simple* or *aggregate*; simple, when no part of the fructification is common to many flowers or florets, but is confined to one only; aggregate, when the flower consists of many florets collected into a head, by means of some part of the fructification common to them all, as by a common receptacle, or common calyx; as in *dipsacus*, *scapiosa*, &c. From the different structure, disposition, and other circumstances of the receptacle or calyx, being the only part common to aggregate flowers, arise seven subdivisions.

1. *Aggregate flowers*, properly so called, are formed by the union of several lesser flowers, placed on partial peduncles on a common dilated receptacle, and within a common perianthium; and in those flowers where each floret has its proper calyx, that is also a perianthium. A flower is said to be *radiate*, when the florets in the radius or circumference differ from those in the disk; in which case they are generally larger, and are called semi-florets, from their difference in form, and in distinction from those of the disk, which are called proper florets; and they also differ as to sex, which gives rise to

several of the orders in the class syngenesia, which contains the compound flowers.

2. *Compound aggregate flowers* consist also of several florets, placed sitting (or without partial peduncles) on a common dilated receptacle, and within a common perianthium; and where each floret has its proper calyx, it is also a perianthium. Compound flowers also admit of a further description, viz. each floret consists of a single petal, with generally five divisions, and having five stamina distinct at the base, but united at the top by the antheræ into a cylinder, through which passes the style of the pistillum, longer than the stamina, and crowned by a stigma with two divisions rolled backwards, and having a single seed placed upon the receptacle under each floret. This is the general character of a compound flower, to which there are a few exceptions; it also differs when the flower is radiate; but the essential character of a regular floret consists in the antheræ being united so as to form a cylinder, and having a single seed placed upon the receptacle under each floret.

3. *Umbellate aggregate* are when the flower consists of many florets placed on fastigate peduncles proceeding from the same stem or receptacle, and which, though of different lengths, rise to such a height as to form a regular head or umbel, whether flat, convex, or concave. Both the common and partial calyx Linnæus calls an involucre. It is called a simple umbel when it has no lesser divisions; a compound umbel when each peduncle is subdivided at its extremity into many lesser peduncles for supporting the flowers, so as to form several little umbellas, uniting in one head; the whole together is called an universal umbel, and the little umbellas are called partial umbels. In some genera, that have radiated umbels, the florets of the centre and those of the circumference differ both as to sex and size; but in general each have five petals, five stamina, and two styles; or one that is bifid, with a germen placed beneath, and two naked seeds, which when ripe, separate below, but remain connected at the top.

4. *Cymous aggregate*, (from cyma, a sprout), called by Linnæus a receptacle, is when several fastigate peduncles proceed from the same centre like the um-

bel, and rise to nearly an even height; but unlike the umbel, the secondary or partial peduncles proceed without any regular order, as in *sambucus*, *viburnum*, &c.

5. *Amentaceous aggregate* are such flowers as have a long common receptacle, along which are disposed squamæ or scales, which form that sort of calyx called amentum or catkin, as in *corylus*, *pinus*, *juglans*, &c. Amentaceous flowers generally want the petals, and all of them are of the classes monœcia and diœcia.

6. *Glumous aggregate* are such flowers as proceed from a common husky calyx belonging to grasses, called gluma; many of which are placed on a common receptacle called rachis, collecting the florets into the spike, as *tritium*, *hordeum*, *secale*, *lolium*, &c.

7. *Spadiceous aggregate* are also such flowers as have a common receptacle protruded from within a common calyx, called spathe, along which are disposed several florets. Such a receptacle is called spadix; and is either branched, as in *phœnix*, or simple, as in *narcissus*, &c. In this last case, the florets may be disposed either all round it, as in *calla*, *dracontium*, *pothos*, &c. on the lower side of it, as in *arum*, &c. or in two sides, as in *zostera*, &c. These flowers have generally no partial calyx.

Under the head of inflorescence, might also be mentioned the *æres* of plants. There are, besides the above, several other modes of flowering, properly so called, that come under the general term inflorescence, and often afford the best marks to discriminate the species. They are chiefly expressed as follows:—

1. *Verticillus*, a whorl, when the flowers are placed in whorls at each joint round the common stalk: they have very short partial peduncles, are all of the labiated kind, and have either two or four stamina, and four naked seeds, as in *salvia*, *marubium*, *mentha*, &c. A verticil has several distinctions, as naked, bracted, &c. and all those genera with four stamina are of the class didynamia, as is seen in *mint*, *thyme*, &c.

2. *Capitulum*, a little head, is when many flowers are connected into nearly a globular form or head, on the summit of the common stalk, sometimes with

and sometimes without partial peduncles, as in *gomprena*, &c. and is distinguished by its shape, and other circumstances. Under capitulum is now introduced the term fasciculus, (a little bundle), which was formerly considered as distinct. It means when the peduncles are erect, parallel, approaching each other, and raised to the same height, as in *sweet-william*, where they generally proceed from different parts of the common stalk, opposite to each other.

3. *Spica*, a spike, is when the flowers, having no partial peduncles, are arranged alternately around a common single peduncle. It is called *spica secunda*, (a single-rowed spike), when the flowers are all turned one way, following each other; and *spica disticha* (a double-rowed spike), when the flowers stand pointing two ways, as in *lolium*, &c.; and it is distinguished by shape and other circumstances.

4. *Corymbus*, a cluster of ivy-berries, when the lesser peduncles of the flowers proceed from different parts of the common peduncle or stalk; and though of unequal lengths, and sometimes single, sometimes branched, yet form a regular surface at the top, as in the siliquose plants. The corymbus may be supposed to be formed from a spike, by adding partial peduncles to the flowers, and seems to be the mean between the racemus and umbella, the peduncles rising gradually from different parts of the common stalk, like those of the raceme, and proceeding to a proportionable height like those of the umbel.

5. *Thyrus*, a young stalk, a mode of flowering resembling the cone of a pine. Linnæus defines it a panicle contracted into an ovate or egg-shaped form; the lower peduncles, which are longer, horizontally: and the upper, which are shorter, mount vertically, as *syringa*, &c.

Racemus, a bunch of grapes, is when the flowers are placed on short partial peduncles, proceeding as little lateral branches from and along the common peduncle. It resembles a spike in having the flowers placed along a common peduncle, but differs from it in having partial peduncles: it also differs from a corymbus in the shortness and equal length of its peduncles, not forming a regular surface at the top, as in *ribes rubrum*, *vitis*.

6. *Panícula*, the tuft upon reeds, is when the flowers are dispersed upon peduncles variously subdivided; or it is a sort of branching spike, composed of several smaller spikes, attached along a common peduncle, as in *avena*, *panicum*, and several other grasses, and many other plants. When the partial peduncles diverge and hang loose, it is called a diffuse, and when they converge, it is called a close, panicle.

7. *Azillares*, such flowers as proceed from the angle formed by the leaf and the stem, as is most common.

8. *Terminales*, such flowers as terminate the stalk or branch. Every other mode of flowering is called the inflorescence, whether opposite to the leaves, lateral, single, double, erect, bending, &c.

Luxuriant or double flowers, are considered only as varieties. A luxuriant flower is supposed generally to be owing to superabundant nourishment; the luxuriant part is generally the corolla, but sometimes the calyx also. There are three degrees of luxuriant flowers, viz 1. *multiplicatus*; 2. *plenus*; and 3. *prolifer*.

1. *Flos multiplicatus* is when the petals of the corolla are only so far multiplied as to exclude part of the stamina; and is called duplicate, triplicate, quadruplicate, &c. according to the number of rows of petals.

2. *Flos plenus* is when the corolla is so much multiplied as to exclude all the stamina, which is occasioned by the stamina turning petals, and the flower is often so crowded as to exclude or choke the pistillum also. Therefore, as the essential parts of generation are thus wholly or in part destroyed, the plants become barren and imperfect, and no seed, or very little, can be expected from them. Flowers with one petal are not very subject to fulness; when they are, it generally arises from an increase of the divisions of the petal. It is most usual in flowers of many petals, where it arises various ways; sometimes by multiplication of the petals only, sometimes of the calyx or nectarium, and sometimes of all. Compound flowers are also subject to luxuriance, arising several ways.

3. *Flos prolifer* is when one flower grows out of another; this generally happens in full flowers, from their greater luxuriance. In simple flowers

it rises from the centre, and proceeds from the pistillum, shooting up into another flower, standing on a single foot-stalk. In aggregate flowers (properly so called) many footstalk flowers are produced out of common calyx. In umbellate flowers, a second umbel proceeds from the centre of the first umbel, producing little umbels, which by a greater exertion of luxuriance, may produce others with little umbels, and thus may produce several heads of flowers, each growing out of that immediately below it, furnished with little umbels variously compounded. A prolific flower is so called leafy (*frondosus*,) when it produces branches with flowers and leaves; which, though rare, sometimes happens in *rosa*, *anemone*, *monarda*, and others. As in luxuriant flowers many parts of the natural character are deficient in the whole, or in any part, they can only be distinguished by the general habit, and by such parts as remain in the natural state; as very often by the calyx, and in the polypetalous flowers, the lowest series or rows of petals remain the same, as in *rosa*, *papaver*, *nigella*, &c.

4. *Flos mutilatus* is the opposite imperfection, being such a flower as occasionally is deprived of all, or the greatest part of the petals, yet bears seeds, as in some species of *tussilago*, *campanula*, &c. This term is opposed to luxuriance, and is supposed by Linnæus to be caused by a defect of heat, though it may also happen from other causes.

VII. *The habit of plants*, by which ancient botanists meant the whole external appearance of every part, whereby they were arranged in their several systems, is by Linnæus applied to the agreement of plants of the same genus, or natural order, chiefly in the following circumstances:

1. *Germination*. The structure and disposition of the bulb, as solid, coated, scaly, stem. Also of the bud; its origin petioled, stipuled, cortical; its contents leafy, floral, common.

2. *Vernation*. The complication of the leaves within the bud, as conduplicate or doubled together; convolute or rolled together; involute or rolled in; revolute or rolled back; imbricated or tiled; equitant or riding; obvolute or rolled against each other; plaited or folded over; spiral or coiled

like a watch-spring, one end in the centre.

3. *Estivation*. The state of the bud in summer, as convolute, imbricated, conduplicate, valved, unequally valved.

4. *Tortion*. The twisting or bending of the parts, as uniform, dissimilar, from the right, from the left, reciprocal, reserpine, spiral.

5. *Nuptials*. Male, female, androgynous, hermaphrodite.

6. *Semination*. The shape and other circumstances of the seed, as tail, wing, tuft, awn, hooks, gluten, curvature. Also of the pericarpium; as berrying, inflation, viscosity, elasticity, structure.

7. *Placentation*. The number and disposition of the cotyledons; or if wanting.

8. *Variation*. Of colour, size, pubescence. 1. *External*: plaited, bundled, broad-leaved, curled, awnless. 2. *Internal*: mutilated, great-flowered, luxuriant, crested, viviparous, bulb-bearing. By variation or variety, are meant such differences as are only incidental to vegetables, and are not found constant and unchangeable; that is, where plants raised from the same seed, by some accidental cause differ in their form and appearance from the true character of the species to which they belong; which cause being removed, the plant is restored to its true specific character; and these incidental varieties chiefly arise by difference of soil or culture in some of the above circumstances. And though it is as necessary to collect varieties under their proper species, as under their proper genera, yet it is often more difficult: 1st, from the difficulty of ascertaining the genus, and, 2dly, from the danger of confounding the species; and sometimes some parts of the specific character itself are also subject to variety, particularly the leaves; though in general the true specific character is constant and unchangeable, arising from circumstances in which plants of the same genus are found to disagree, which distinctions are commonly taken with most certainty from the parts explained in this section.

VIII. *The hybernaculum, winter lodgment*, is that part of a plant which defends the embryo or future shoot from external injuries during the winter, and is either a *bulb* or a *bud*.

i. *A bulb*, (bulbus), is a large sort of bud produced under ground, placed upon the caudex of certain herbaceous plants, hence called bulbous roots, all of which are perennial, that is, perpetuated by their bulbs or ground buds, as well as by seeds; they are therefore improperly called roots, being only the hybernacle of the future shoot. Bulbs are of the following sorts:

1. *Squamous*, consisting of scales laid over each other like tiles, as in the *Lily*.

2. *Solid*, consisting of a close substance, as in *tulips*.

3. *Coated*, consisting of many coats infolding each other, as in *onions*.

2. *Cauline*, produced not only from the sides of the principal bulb, called a sucker or offset, but from other parts of the stem; as in *erow* or *wild garlic*, and in some species of onion, hence called bulbiferous, where they are produced at the origin of the umbel of flowers.

ii. *A bud*, (gemma), is the embryo of the plant, seated upon the stem of the branches, covered with scales. In general there are three sorts of buds: that containing the flower only, as in *poplar*, *ash*, &c. where the leaf-buds and flower-buds are distinct; that containing the leaves only, as in *birch*, &c.; and that containing both flower and leaves, as in the generality of plants; and these last sometimes contain leaves and male flowers, sometimes leaves and female flowers, sometimes leaves and hermaphrodite flowers. Annual plants are only renewed from seeds; and several other plants, both trees and shrubs, have no winter buds. It is also observed in hot countries, that few plants have buds; or at least that they are without that scaly covering which seems essential to a bud, and constitutes the hybernacle; instead whereof are protruded small feather-like branches from the wings of the leaves, (defence and protection from cold not being necessary); whereas in cold countries most plants have buds, which are wrapped up all the winter, in readiness to greet the approaching spring.

Analogous to the protection afforded by the buds, is the *sleep of plants*, which, according to Linnæus, happens various ways; as by converging, including, surrounding, fortifying, conduplicating, involving, diverging, depending,

inverting, imbricating. This disposition in plants is very remarkable in *chickweed*, *pimpernell*, *dandelion*, *goat's-beard*, &c. which expand their flowers only at certain times of the day, and shut them up at the approach of night or a storm; from which may be prognosticated a change of weather. In many plants, not only the flowers, but the young shoots, are defended from external injuries by the nearest leaves converging and inclosing the tender rudiments. Thus we have delineated the principal outlines of plants; but a more particular description of those parts which serve chiefly to characterise the different classes, orders, genera, and species, will be given in the following sections, particularly.

SECT. II.—Of the classes of plants.

The *flowers of plants* Linnæus very properly made the sole foundation of his beautiful system of botany. Being the same in all parts of the globe capable of producing plants, the classification founded upon them affords a kind of universal language (so to speak) to botanists, whereby they can no longer mistake each others' meaning, as has unfortunately been the case, less or more, with almost all former botanical systems.

Flowers, in respect of sex, are distinguished into *male*, *female*, *hermaphrodite*, and *neuter*. *Male flowers* are such as have only the stamina, as in the classes *monœcia*, *diœcia*, and *polygamia*. *Female flowers* are such as have only the pistilla, as in the same classes. *Hermaphrodite flowers* are such as have both the stamina and pistilla in the same flower, as in almost all the other classes: hermaphrodites are also distinguished into male hermaphrodites, when the female is ineffectual; and female hermaphrodites, when the male is ineffectual. *Neuter flowers* are such as have neither stamina or pistilla perfect.

The plants themselves also take a denomination from the sex of their flowers. *Male plants* are such as bear male flowers only; *female plants* bear female flowers only; *hermaphrodite plants* bear hermaphrodite flowers only. *Androgynous plants* are such as bear male and female flowers, distinct upon the same root, as in the class *monœcia*. *Polygamous plants* are such as bear hermaphrodite flowers, and male or fe-

male flowers, or both distinct, on the same or on different roots.

When on the same root, the flowers are either male hermaphrodites and female hermaphrodites; or hermaphrodites and male; or hermaphrodites and female, distinct: if on different roots, the flowers are either hermaphrodites and male; hermaphrodites and female; hermaphrodites and both male and female; or are androgynous and male; and sometimes androgynous and male and female on three distinct plants.

TABLE OF THE CLASSES.

1. MONANDRIA, *i. e.* one male or stamen in an hermaphrodite flower.
2. DIANDRIA, *i. e.* two stamina.
3. TRIANDRIA, — three ditto.
4. TETRANDRIA, — four ditto.
5. PENTANDRIA, — five ditto.
6. HEXANDRIA, — six ditto.
7. HEPTANDRIA, — seven ditto.
8. OCTANDRIA, — eight ditto.
9. ENNEANDRIA, — nine ditto.
10. DECANDRIA, — ten ditto.
11. DODECANDRIA, — twelve ditto.
12. ICOSANDRIA, — twenty or more ditto, inserted into the calyx.
13. FOLYANDRIA, *i. e.* all above twenty stamina inserted into the receptacle.
14. DIDYNAMIA, *i. e.* four stamina, two long, and two short.
15. TETRADYNAMIA, *i. e.* six stamina, four long, and two short.
16. MONADELPHIA, the stamina united into one body by the filaments.
17. DIADELPHIA, the stamina united into two bodies by the filaments.
18. POLYADELPHIA, the stamina united into three or more bodies by the filaments.
19. SYNGENESIA, the stamina united in a cylindrical form by the antheræ.
20. GYNANDRIA, the stamina inserted into the pistillum.
21. MONŒCIA, male and female flowers distinct, in the same plant.
22. DIŒCIA, males and females in different plants, of the same species.
23. POLYGAMIA, male, female, and hermaphrodite flowers in the same or different plants.
24. CRYPTOGAMIA, the flowers invisible, so that they cannot be ranked according to the parts of fructification, or distinctly described.

These 24 classes comprehend every known genus and species. It is easy to class a plant belonging to any of the first 11 classes, as they all depend on

the number of stamina, without regard to any other circumstance: only it is to be observed that the 11th class, dodecandria, although its title is expressive of 12 stamina only, consists of such plants as are furnished with any number of stamina from 11 to 19 inclusive. The reason of the chasm in the classes from 10 to 12 stamina is, that no flowers have yet been found with only 11, so as to form a class. The *reseda* indeed has sometimes 11, but often more; and those of the *brousses* are united below, which brings it under monadelphia.

The 12th class requires more attention. When the stamina amount to above 20, a young botanist will be apt to imagine that the plant belongs to the polyandria class. In reducing plants of this kind to their classes, particular regard must be had to the insertion of the stamina. If they are inserted into the calyx, the plant belongs to the icosandria class; if into the receptacle, it belongs to the polyandria. This distinction it is very necessary to observe, as the fruits of the latter class are frequently poisonous.

The 14th class is likewise in danger of being confounded with the 4th, the number of stamina being the same; but in the 14th, two of them are uniformly much shorter than the other two; at the same time each particular stamen belonging to the different pairs stands directly opposite to one another. The plants of this class are quite labiate, or gaping blossoms, as in the *snap-dragon*, *fox-glove*, *ground ury*, &c. The 15th class may be mistaken for the 6th, as they consist of the same number of stamina; but in the 15th, four of them are uniformly longer than the other two, and these two are always opposite to each other. The plants of this class are all cruciform; that is, four-petalled, like a cross, as in the *cabbage*, *wall-flower*, &c.

In the 16th class, the stamina are united below, but distinct above. The pistilla are also united below in one substance with the receptacle, which is prominent in the centre, but divided above into as many threads as there are germina.

In the 17th class, the corolla is papilionaceous, butterfly-shaped, and the petals are expressed by distinct names; viz. *vexillum*, the uppermost, which

covers the rest; *alæ*, the two at each side of the flower; and *carina*, the lowest, which is often bipartite, and placed between the *alæ*. The antheræ are most frequently 10, one on the upper filament, and 9 on the lower. The pistillum grows out of the receptacle within the calyx. See the *common pea*.

The 19th class consists of plants whose flowers are composed of a great number of small flowers, inclosed in one common calyx, and therefore styled compound flowers. The whole compound flower in its aggregate state is styled flosculose, because composed of these flosculi or florets. The essence of a flosculose flower consists in having the antheræ united in a cylinder, and a single seed below the receptacle of the floret.

In the 20th class, the stamina grow either upon the pistillum, or upon a receptacle that stretches out in the form of a stylus, and supports both the stamina and the pistillum. The other classes are sufficiently distinguished in the table.

SECT. III.—Of the orders of plants.

The orders are inferior divisions, which lead us a step nearer the genus. In the first 13 classes they are taken from the female parts, in the same manner as the classes from the male; and named *monogynia*, *digynia*, *trigynia*, *tetragynia*, &c. i. e. one, two, three, four, &c. pistilla, or female parts. When the pistils have no stalk or filament like the stamina, they are numbered by the stigmata or tops of the pistils, which in that case adhere to the capsule in the form of small protuberances, as may be observed in the flowers of the *poppy*, &c.

In the 14th class the orders are derived from a different source. The plants belonging to it have their seeds either inclosed in a capsule, or altogether uncovered. Hence they are divided into *gymnospermia*, comprehending such as have naked seeds; and *angiospermia*, comprehending such as have their seeds covered, or inclosed in a capsule.

The 15th class is divided into two orders, viz. the *siliculosa*, or those which have a short pod: and the *siliquosa*, or those which have a longer one.

The orders of the 16th, 17th, 18th, and 20th classes, are taken from the

number of stamina; e. g. *monadelphia*, *pentandria*, *decandria*, *polyandria*, &c.

The orders of the 19th class are, 1. *Polygamia æqualis*, those whose floscules are all furnished with stamina and pistils. *Polygamia spuria*, comprehends plants that have hermaphrodite floscules in the disk, and female floscules in the margin; which is made the foundation of the three next orders, viz. 2. *Polygamia superflua*, those whose hermaphrodite flowers in the disk are furnished with stigmata, and bear seed, and whose female flowers in the radius likewise produce seeds. 3. *Polygamia frustranea*, such as have hermaphrodite seed-bearing floscules in the disk; but whose floscules in the radius, having no stigmata, are barren. 4. *Polygamia necessaria*, is the reverse of the former: the hermaphrodite flowers in the disk want stigmata, and are barren: but the female floscules in the radius are furnished with stigmata, and produce seeds. 5. *Polygamia segregata*, many floscules inclosed in one common calyx, and each of the floscules likewise furnished with a perianthium proper to itself. 6. *Monogamia*. This order consists only of seven genera, none of which have properly compound flowers, but are ranked under this class merely from having their stamina united by the antheræ.

The orders of the 21st class are partly taken from the number of stamina, and partly from the names and characters peculiar to some of the other classes; e. g. *monœcia triandria*, *monœcia syngenesia*, *monœcia gynandria*.

The orders of the 22nd class are founded upon the number, union, and situation of the stamina in the male flowers. The orders of the 23rd are all taken from classical characters; e. g. *polygamia monœcia*, *polygamia diœcia*, and *polygamia triœcia*.

The 24th class is divided into 4 orders: 1. *Filices*, comprehending all plants that bear their seeds in the back or edges of the leaf, and those that are called capillary plants. 2. *Musci*, which comprehends all the moss kind. 3. *Algæ*, including the lichens, fuci, and many others whose parts of fructification are either altogether invisible or exceedingly obscure. 4. *Fungi*, comprehending all the mushroom tribe.

(For a delineation of the classes, &c. see plates).

TABLE OF THE ORDERS.

CLASSES.	NUMBER AND NAMES OF THE ORDERS.
1. MONANDRIA	2 Monogynia, Digynia.
2. DIANDRIA	3 Monogynia, Digynia, Trigynia.
3. TRIANDRIA	3 Monogynia, Digynia, Trigynia.
4. TETRANDRIA	3 Monogynia, Digynia, Tetragynia.
5. PENTANDRIA	6 { Monogynia, Digynia, Trigynia, Tetragynia, Pentagynia, Polygynia.
6. HEXANDRIA	5 { Monogynia, Digynia, Trigynia, Tetragynia, Polygynia.
7. HEPTANDRIA	4 Monogynia, Digynia, Tetragynia, Heptagynia.
8. OCTANDRIA	4 Monogynia, Digynia, Trigynia, Tetragynia.
9. ENNEANDRIA	3 Monogynia, Trigynia, Hexagynia.
10. DECANDRIA	5 { Monogynia, Digynia, Trigynia, Pentagynia, Decagynia.
11. DODECANDRIA	5 { Monogynia, Digynia, Trigynia, Pentagynia, Dodecagynia.
12. ICOSANDRIA	5 { Monogynia, Digynia, Trigynia, Pentagynia, Polygynia.
13. POLYANDRIA	7 { Monogynia, Digynia, Trigynia, Tetragynia, Pentagynia, Hexagynia, Polygynia.
14. DIDYNAMIA	2 Gymnospermia, Angiospermia.
15. TETRADYNAMIA	2 Siliculososa, Siliquosa.
16. MONADELPHIA	8 { Triandria, Pentandria, Octandria, Enneandria, Decandria, Endecandria, Dodecandria, Polyandria.
17. DIADELPHIA	4 Pentandria, Hexandria, Octandria, Decandria.
18. POLYADELPHIA	4 Pentandria, Dodecandria, Icosandria, Polyandria.
19. SYNGENESIA	6 { Polygamia æqualis, Polygamia superflua, Polygamia frustranea, Polygamia necessaria, Polygamia segregata, Monogamia.
20. GYNANDRIA	9 { Diandria, Triandria, Tetrandria, Pentandria, Hexandria, Octandria, Decandria, Dodecandria, Polyandria.
21. MONŒCIA	11 { Monandria, Diandria, Triandria, Tetrandria, Pentandria, Hexandria, Heptandria, Polyandria, Monadelphia, Syngenesia, Gynandria.
22. DIOECIA	15 { Monandria, Diandria, Triandria, Tetrandria, Pentandria, Hexandria, Octandria, Enneandria, Decandria, Dodecandria, Icosandria, Polyandria, Monadelphia, Syngenesia, Gynandria.
23. POLYGAMIA	3 Monœcia, Dioecia, Triœcia.
24. CRYPTOGAMIA	4 Filices, Musci, Alge, Fungi.
APPENDIX	1 Palmæ.

Some botanists rank these last as a 25th class; but this is improper, as they are all capable of being arranged in the preceding classes of the system, although on account of their singular structure, Linnæus placed them in an appendix. They contain such genera as have a spadix and spatha, i.e. whose flowers and fruit are produced on that particular receptacle called a spadix, protruded from a common calyx in the form of a sheath, called spatha. This order consists of trees and shrubs only.

These have always a simple stem, not branched, bearing leaves at the top, resembling those of fern, being a composition of a leaf and a branch, called frondes; and the corolla has always three petals.

SECT. IV.—*The genera of plants.*

In investigating the genus of a plant, we must first consider its essence. The essence of every vegetable, says Linnæus, consist in the fructification; the essence of the fructification in the flower

and fruit; the essence of the flower consists in the antheræ and stigma, and the essence of the fruit in the seed. Hence he makes the flower and fruit the foundation of his generic distinctions.

These are generally composed of seven parts; the *calyx*, the *corolla*, the *stamina*, the *pistilum*, the *pericarpium*, the *semina*, and the *receptaculum*; and the presence or absence, the number, figure, proportion, and situation, of the several parts, constitute the genus. But as there are few genera wherein all the parts of the natural character are constant in every one of the species, it is necessary to fix upon such circumstances as are constant in both genus and species, and call those the essential or ruling character; both to distinguish one genus from another, and to fix the several species and their varieties to their respective genera; for which purpose, in some cases, Linnæus was obliged to have recourse to the nectarium. The first four parts of the fructification are properly parts of the flower, and the last three of the fruit.

I. The *calyx*, or *cup*, is the termination of the outer bark of a plant. Its chief use is to inclose, support, and protect, the other parts of the fructification. When present, it is seated on the receptacle: and is distinguished by its figure, by the number, division, and shape of its leaves, or segments, and by the following names, according to the circumstances with which it is attended.

1. *Perianthium*, when its station is close to, and surrounds, the other parts of the fructification, is called the perianthium of the fructification: if it includes many floscules, as in *scabiosa*, and other aggregate and compound flowers, it is called a *common* perianthium; if it includes only one floscule, it is called a *proper* perianthium: if it includes the stamina, and not the germen, it is the perianthium of the flower, and is said to be *above*, as in *lonicera*, *ribes*, *campanula*, &c.; if it includes the germen, but not the stamina, it is the perianthium of the fruit, and is said to be *below*, as in *linnea* and *morina*, each of which have two calyxes and two receptacles above each other, one of the flower and the other of the fruit.

2. *Involutum*, when stationed at the foot of an umbel, below the common receptacle, and at a distance from the

flower, is called *universal*, if placed under the universal umbel; and *partial*, if placed under a partial umbel.

3. *Amentum*, consists of a great number of chaffy scales, disposed along a slender axis or common receptacle, which, from its resemblance to a cat's tail, has obtained the name of *catkin*; and these flowers have generally no petals: sometimes the same amentum supports both male and female flowers, distinct, on the same plant, as in *carpinus*, &c.; sometimes the male and female flowers are removed from each on the same plant, and the amentum supports only the male flowers, and the female flowers are inclosed by a perianthium, as in *corylus*, *fagus*, &c.; and sometimes an amentum only supports male flowers on one plant, and female flowers on another plant, as in *salix*, *populus*, &c.

4. *Spatha*, a sort of calyx growing from the stalk, bursting lengthways, and protruding a spadix, supporting one or more flowers, which have often no perianthium. It consists either of *one leaf*, with a valve on one side only, as in the greater number of spathaceous plants; or of *two leaves*, with two valves, as in *stratiotes*, &c., or is *imbricated*, as in *musa*, &c. with one or two valves.

5. *Gluma*, a husk, chiefly belongs to *corn* and *grasses*, consisting of one, two, three, or more valves folding over each other like scales, and frequently terminated by a long, stiff, pointed prickle, called the *arista*.

6. *Calyptra*, the proper calyx of *mosses*, is placed over the antheræ of the stamina, resembling an extinguisher, a hood, or monk's cowl.

7. *Volva*, so named from its infolding, is the proper calyx of *funguses*, being membranaceous, and surrounding the stalk, before their expansion.

It is often difficult to distinguish the *calyx* from the *bractææ*, which are found on many plants, situated on the flower-stalks: and are often so near to the lower parts of the fructification as to be mistaken for the calyx, as in *tilia*, *passiflora*, &c., but they may be best distinguished by this rule; the *bractææ* differ in shape and colour from the other leaves of the plant, but are commonly of the same duration; whereas the *calyx* always withers when the fruit is ripe, if not before.

II. The *corolla* is the termination of

the inner bark of the plant, which accompanies the fructification, in the form of leaves variously coloured. It is generally seated on the receptacle, sometimes on the calyx; serving as an inner work of defence to the part it incloses; as the calyx, which is usually of stronger texture, does for an outer. *The leaves of the corolla are called petals*; by the number, division, and shape of which, it is distinguished. It is said to be *inferior* or below, when it includes the germen, and is attached to the part immediately below it, as in *borago*, &c., and it is said to be *superior* or above, when it is placed above the germen, as in *cratægus*, &c. In respect to duration, ripe, as in *nymphæa*; or falls off at the first opening of the flower, as in *actæa*; or with the stamina and other parts of the flower, as in most plants; or does not fall, but withers, as in *campanula*, &c.

The *nectarium*, Linnæus says principally belongs to the corolla, as an appendage to the petals: and contains the honey, which is the principal food of bees and other insects. But though, in plants where it is found, it may be attached to the corolla, and be then most evident; yet it is almost as often attached to other parts of the fructification: Linnæus therefore chiefly makes use of it as an essential character in many of the genera, as being less variable than others; and observes, that when it is not united with the substance of the petals, those plants are generally poisonous: the tube or lower part of monopetalous flowers, he considers as a true nectarium, because it contains a sweet liquor. But as it affords very singular varieties in other instances, it has the following distinctions.

1. *Calycine nectaria*, such as are situated upon, and make a part of, the calyx; as in *tropæolum*, *monotropa*, &c.

2. *Corollaceous nectaria* are attached to the corolla, and are called *calcarate* when they resemble a *spur*. They are either on flowers of one petal, as in *valeriana*, &c., or on flowers of many petals, as in *viola*, &c. or within the substance of the petals, as in *ilium*, *iris*, &c.

3. *Stamineous nectaria* attend the stamina, and are either seated upon the antheræ, as in *adenanthera*; or upon the filaments, as in *laurus*, &c.

4. *Pistillaceous nectaria* accompany the pistillum, and are placed upon the germen, as in *hyacinthus*, *butomus*, &c.

5. *Receptaculaceous nectaria* join the receptacle, as in *polygonum*, *sedum*, &c.

6. *Nectaria* that crown the corolla, are placed in a row within the petals, though entirely unconnected with their substance, as in *silene*, &c., and in this situation often resemble a cup, as in *narcissus*, &c.

7. *Nectaria* of singular construction, are such as cannot properly be placed under any of the foregoing distinctions, as in *amomum*, *curcuma*, *saliva*, *urtica*, &c. The proper use of the nectarium is not yet discovered.

III. The *stamina*, or *chives*, are the *males of the flower*, proceeding from the wood of the plant. Each stamen consists of two parts, viz. the *filament* and the *antheræ*. In most flowers they are placed upon the receptacle within the corolla, and round the germen; and are chiefly distinguished by number.

1. The *filament* is the thread-shaped part of the stamen, serving as a footstalk to elevate the antheræ, and sometimes has jags or divisions; which are either two, as in *salvia*; three, as in *fumaria*; or nine, as in the class *dialdelphia*. They are also distinguished by their *form* and *figure*, as awl-shaped, thread-shaped, hair-like, spiral, revolute, &c., by their *proportion*, as equal, unequal, irregular, long, or short; and by their *situation*, being generally opposite to the leaves or divisions of the calyx, and alternate with the petals; that is, when the divisions of the calyx are equal in number to the petals and to the stamina. In monopetalous flowers they are generally inserted into the corolla; but scarcely ever in flowers of more than one petal, but into the receptacle; yet in the class *icosandria* they are inserted into the calyx or corolla (though the flowers have many petals), as also in a few other plants. But in the class *polyandria*, and most other polypetalous plants, they are inserted into the receptacle, like the calyx and corolla. The class *gynandria*, however, is an exception to the above rules, where the stamina are sometimes without filaments.

2. The *anthera*, from *ἄνθος*, a flower, emphatically so called from its great utility in the fructification, is the top of the filament, containing the impreg-

nating pollen; and is either one to each filament, as in most plants; or one common to three filaments, as in *cucurbita*, &c., or one common to five filaments, as in the class syngenesia: or sometimes there are two antheræ to each filament, as in *ranunculus* and *mercurialis*; three to each filament, as in *fumaria*; five to three filaments, as in *bryonia*; or five to each, as in *theobroma*. The anthera is also distinguished by its form or figure, as oblong, round, angular, &c. It consists of one or more cells, which burst differently in different parts; either in the side, as in most plants; on the top; or from the top to the base. It is also fastened to the top of the filament; either by its base, as in most plants; or horizontally by its middle to the top of the filament, so poised as to turn like a vane: or it is fixed by its side, leaning to the top of the filament, then called incumbent. Sometimes it grows to the nectarium, as in *costus*; to the receptacle, as in *arum*; or to the pistillum, in the class gynandria.

IV. *The pistillum*, or the female of the flower, proceeding from the pith of the plant, is that erect column which is generally placed in the centre of the flower, amidst the stamina; and consists of three parts, the *germen*, the *style*, and the *stigma*.

1. *The germen* is the base of the pistillum, supporting the style. After some time, it becomes a *seed-vessel*, and may therefore be considered as the rudiment of the pericarpium. It is distinguished by its *shape*, *number*, and *situation*; and is said to be *above* or *below*, according to its situation above or below the attachment of the corolla.

2. The *style* elevates the stigma from the germen, to receive the influence of the stamina, and to convey it down to the germen as through a tube. It is distinguished either by its *number*, which, when present (or when absent, the number of stigmata) gives rise to most of the orders, and are called so many females; or by its divisions, being double, treble, or quadruple, &c. though joined at the base; or by its *length*, being longer, shorter, or equal with the stamina; or by its *proportion*, being thicker or thinner than the stamina; or by its *figure*, being regular, cylindric, awl-shaped, bent, &c.; or by its *situation*, being generally on the top of the

germen, though in some instances supposed to be both above and below, as in *capparis* and *euphorbia*; unless the lower part in these genera are considered as the extension of the receptacle. It is often placed on the side of the germen, as in *hirtella*, *suriana*; also in *rosa*, *rubus*, and the rest of the plants in the class icosandria and order polygynia. With respect to *duration*, it generally falls with the other parts of the flower; but in some plants it is permanent, and attends the fruit to its maturity, as in the class tetradynamia. In flowers which have no style, the stigma adheres to the germen.

3. The *stigma*, when single, is generally placed like a head on the summit of the style: when several, they are placed on the top, or regularly disposed along the side, and covered with moisture, to retain the pollen of the antheræ. It is *distinguished* either by its *number*, being single in most plants; or by its *divisions*, figure, length, thickness, or *duration*; as in most plants it withers when the germen is become a seed-vessel; in some it is permanent, as in *papaver*.

V. *The pericarpium is the germen grown to maturity, and become a matrix*. All plants, however, are not furnished with a seed-vessel, as *corylus*, &c. In many, it is supplied chiefly by the calyx, which converging incloses the seeds till they arrive at maturity; as is the case with the rough-leaved plants, and the labial and compound flowers of the classes pentandria, didynamia, and syngenesia. Sometimes the receptacle supplies the office of seed-vessel, as in *gundelia*; and sometimes the nectarium, as in *carex*. The pericarpium is situated at the receptacle of the flower, either above or below, or both, as in *saxifraga* and *lobelia*; and is distinguished by the following appellations, according to its different structure.

1. *Capsula* is frequently succulent whilst green; but when ripe, it is a dry husky seed-vessel, that parts to discharge its contents: and by some elastic motion, the seeds are often darted forth with considerable velocity, as in *dictamnus*, &c. It *opens* either at the *top*, as in most plants; at the *bottom*; at the *side*, horizontally across the *middle*; or *longitudinally*; and if it is articulated or jointed, it opens at *each of the joints*, which contains a single seed.

It is distinguished *externally*, by its number of valves; and *internally*, by the number of its cells, wherein the seed is inclosed; as well as by its shape and substance.

2. *Siliqua*, a pod, is a pericarpium of two valves; but as some are long, others round or broad, Linnaeus distinguishes them by their form into *siliqua* and *silicula*, which give the name to the two orders in the class tetradynamia. The *siliqua* (is a long pod), being much longer than broad, as in *brassica*, *sinapis*, &c.; the *silicula* (a little pod), is a roundish pod, either flat or spherical, and the length and breadth nearly equal, as in *lunaria*, *draba*, &c. In both, the apex, which had been the style, is often so long beyond the valves, as to be of equal length with the pod; and the seeds in both are fastened alternately by a slender thread, to both the sutures or joinings of the valves.

3. *Legumen*, (pulse), is also a pod, and is likewise a pericarpium of two valves, wherein the seeds are fastened to short receptacles along the upper suture only, on each side, alternate: this chiefly belongs to the papilionaceous flowers, or the class diadelphia.

4. *Folliculus*, or *conceptaculum*, is a pericarpium of one valve only, opening lengthways on one side, and the seeds not fastened to the suture, but to a receptacle within the fruit, as in *asclepias*, &c.

5. *Drupa* is a pericarpium that is pulpy, having no valve. It contains within its substance a nut, or seed inclosed with a hard ligneous crust, as *olea*, *cornus*, &c., and when the drupa is seated below the calyx, it is furnished with an umbilicus like the pomum.

6. *Pomum*, an apple, is also a pulpy pericarpium without a valve; but containing in the middle a membranous capsule, with several cells containing the seeds; and at the end opposite to the footstalk there is generally a small cavity, called *umbilicus* from its resemblance to the navel in animals; and which was formerly the calyx, seated above the fruit, and persistent, as in *pyrus*, *cucumis*, &c.

7. *Bacca*, a berry, is also a pulpy pericarpium without valve, inclosing one or more seeds, which have no membranous capsule or covering, but are disposed promiscuously through the pulp, as in *solanum*, &c., and are gene-

rally placed on footstalks attached to receptacles within the pulp, as in *ribes*, &c. The berry also admits of the following distinction: it is said to be *proper*, when it is a true pericarpium formed of a germen; and *improper* when it is formed from other parts of the fructification, as in *rosa*, *juniperus*, &c. A large succulent calyx becomes a berry; and in *juniperus*, the three petals become the umbilicus; in *poterium* the berry is formed of the tube of the corolla; in *fragaria*, &c. it is formed of the top of the receptacle; in *rubus*, &c. it is formed from a seed, which is the receptacle of the berry; in *ruscus*, &c. it is inclosed within, and is a part of the nectary. The berry is commonly either round or oval, and is frequently furnished with an umbilicus, as in *ribes*, &c. It does not naturally open to disperse the seeds like the capsule, that office being performed by birds and other animals.

8. *Strobilus* is a pericarpium formed of an amentum, being a seed-vessel composed of woody scales placed against each other in the form of a cone, opening only at the top of the scales, being firmly fixed below to a sort of axis or receptacle, occupying the middle of the cone; as in *pinus*, &c. (For parts of flowers and fruits, see plates).

VI. *Semina*, the seeds, are the essence of the fruit of every vegetable, and defined by Linnaeus to be "a deciduous part of the plant, containing the rudiments of a new vegetable, fertilized by the sprinkling of the pollen." They are distinguished according to number, shape, texture, appendage, &c. A seed, properly so called, consists of the five following parts; to which are added the nux and propago.

1. The *corculum*, (from *cor*, a heart) is the essence of the seed, and principle of the future plant; and consists of two parts, viz. *plumula* and *rostellum*. The *plumula* is the part which shoots up into the stem, and the *rostellum* is what forms the root. See *PHYSIOLOGY OF PLANTS*.

2. The *cotyledons* (from *cotyledon*, the hollow of the huckle-bone), are the thick porous side-lobes of the seed, such as the two sides into which a bean divides when soaked in water, and which afterwards come up as the seed-leaves of the plant. If a plant is cut below

the cotyledons, it will scarcely ever put out fresh leaves, but withers and decays; if it is cut above the cotyledons, it generally shoots out afresh, and continues to grow: therefore, if plants whose cotyledons rise above ground, as *turnips*, &c. are cut or eaten into the ground by cattle, they decay; but when the cotyledons remain below ground, as in *grasses*, and are cut or eaten to the ground, they will shoot out afresh. Some plants have only one, as in *grasses* and in *cuscuta*, &c.; others two, as in *vicia*, &c.; *linum* has four; *cupressus* five; and *pinus* ten.

3. The *hilum*, the black spot on a *bean*, called the *eye*, is the external mark on the seed, where it was fastened within the pericarpium.

4. The *arillus*, the proper exterior coat of the seed, that falls off spontaneously, is either *cartilaginous* or *succulent*; yet seeds are said to be naked, when not inclosed in any sort of pericarpium, as in the class and order *didynamia gymnospermia*.

5. The *coronula* is either a small sort of calyx adhering to the top of the seed, like a little crown, and assisting to disperse it by flying, as in *scabiosa*, *knautia*, &c. where the little calyx of the floret becomes the crown of the seed: or a down, which is either feathery, as in *valeriana*, &c. or hairy, as in *tussilago*, &c. This down has generally been thought intended to disperse the seed. The *coronula* is either also sitting, that is, attached close to the seed, as in *hieracium*, &c.; or foot-stalked by a thread elevating and connecting the tuft with the seed, as in *crepis*, &c. Some seeds are furnished with a wing, a tail, a hook, an awn, &c. all coming under the term *coronula*, and tending either to disperse or fix the seeds. Some have an elastic force, to disperse them; which is either in the calyx, as in *oats* and some others; in the pappus, as in *centaurea crupina*; or in the capsule, as in *geranium*, &c. Other seeds, especially those whose pericarpium is a berry, as also the nutmeg and other nuts, are dispersed by birds and other animals.

6. *Nux*, (a nut), a seed inclosed in a hard woody substance, called the shell, which is one-celled, two-celled, &c. and the inclosed seed is called the kernel.

7. *Propago*, a slip or shoot, the seed of a *moss*, which has neither coat nor

cotyledon, but consists only of a naked plumula, where the rostellum is inserted into the calyx of the plant.

VII. The *receptaculum* is the base which receives, supports, and connects, the other parts of the fructification. It is only mentioned by Linnaeus, when it can be introduced as a character varying in shape and surface, as principally in the class *syngenesia*. It is called *proper* when it supports the part of a single fructification only; when it is a base to which only the parts of the flower are joined, and not the germen, it is called a *receptacle of the flower*; in which case the germen, being placed below the receptacle of the flower, has a proper base of its own, which is called the *receptacle of the fruit*; and it is called a *receptacle of the seeds*, when it is a base to which the seeds are fastened within the pericarpium. In some simple flowers, where the germen is placed above the receptacle of the flower, the fruit has a separate receptacle, as in *magnolia*, *uvaria*, &c. in which genera the numerous germina are seated upon a receptacle rising like a pillar above the receptacle of the fructification. It is styled *common*, when it supports and connects a head of flowers in common; as in the amentum, and other aggregate flowers. The *umbella* and *cyma* are also called receptacles. *Rachis*, a filiform receptacle, collecting the florets longitudinally in a spike, in many of the glumose flowers, as *wheat*, *barley*, *rye*, &c. Spadix anciently only signified the receptacle of a *palm* issuing out of a *spatha*, and branched; but now every flower-stalk that is protruded from a calyx called *spatha*, is denominated a *spadix*, as in *narcissus*, &c.

SECT. V.—*The species of plants.*

The genera include a great number of species, distinguished by the specific difference of the root, the trunk, the branches, the leaves, &c. yet all agreeing in the essential generic character.—They are called by trivial names, expressive of the difference of some other circumstance, added to the generic name. To investigate the species, therefore, it is necessary to understand these differences, and to be acquainted with the names by which they are expressed. Several of these have been already incidentally explained; but for a complete enumeration, the reader must have recourse to the GLOSSARY.

to alteration by culture or other accidents. Hence Linnæus asserts the species to be as numerous as there were different forms of vegetables produced at the creation; and considers all casual differences as varieties of the same species.

Hybrid, or mule plants, must be ranked among varieties, whether occasioned by accident, by the pollen of one plant falling upon the pistilla of another, or reared by art; of which Linnæus gives many curious instances.

Varieties may generally be reduced under their species, by comparing the variable marks of the variety with the natural plant; but there are some which are attended with difficulty, and require judgment and experience; particularly in some species of *helleborus*, *gentiana*, *fumaria*, *valeriana*, *scorpiurus*, and *medicago*. In these two last there is a remarkable diversity in the fruit of the individuals. In the *medicago* or *snail trefoil*, in particular, the forms of the real snails, which nature has imitated in these plants, are scarcely more diversified than the fruit of this mimic species; so that the botanist who is studious of varieties, would find no end to his labour, were he to attempt to pursue nature through the various shapes she has wantonly adopted. The whole order of the fungi too, is still a chaos; botanists not being yet able in these to decide what is a species, and what is a variety.

SECT. VI.—Of the natural classes or orders.

Notwithstanding the evident superiority of the sexual system, Linnæus and most other modern botanists are of opinion that there is a natural method, or nature's system, which we should diligently endeavour to find out. (See NATURAL SYSTEM).

BOTRYCHIUM.

Class Cryptogamia Filices. Nat. Ord. *Filices*.

The Characters are—*Capsules nearly globose, naked, smooth, without a ring, united to the stalk of a compound spike, distinct, each of one cell and two valves, connected behind, bursting transversely in front.*

from a torn membranous sheath, erect, three to six inches high, smooth, pale-green, consisting of a leaf two inches long, with six or seven pairs of leaflets. From the base of the leaf springs a stout stalk, bearing a twice or thrice compound, unilateral, smooth spike of capsules, each about half the size of mustard seed; all firmly united in two sessile rows with the linear flat rib or common receptacle. Native of dry hillocks or open heaths, throughout the cooler parts of Europe, bearing capsules in June.

2. *BOTRYCHIUM VIRGINIANUM* (virginian Moonwort). *Frond somewhat ternate, twice pinnate; leaflets decurrent, obovate, cuneiform, sharply toothed; fruit-stalk at the base of the leaf.*—It is a Native of America, in shady woods, on a rich vegetable soil, from Canada to Carolina; is the largest of the genus, and bears its capsules in June and July. It is known by the name of *Rattle-snake fern*, probably from growing near those places where these venomous reptiles are generally found. Introduced 1794.

CULTURE.—The species of this genus are curious plants; they require to be grown in a mixture of loam and peat, and may be increased by dividing at the roots, or by seeds. They are best adapted for pots, or for adorning rock work.

BOUVARDIA (in memory of C. Bouvard, M.D. formerly superintendant of the garden at Paris).

Class Tetrandria Monogynia. Nat. Ord. *Rubiaceæ*.

The Characters are—*Calyx four-leaved; with some teeth between; corolla tubular; anthers included; capsule two-partible, many seeded, seeds edged.*

1. *BOUVARDIA TRIPHYLLA* (blunt leaved Bouvardia). Par. Lond. t. 88. *Leaves ternate lanceolate; stamens included.*—A beautiful, and not very tender plant, which flowers a great part of the year. The stem is from one to two feet high, shrubby, branched, downy when young. Leaves usually three in a whorl, varying in breadth. Flowers an inch long, bright scarlet, in dense terminal, forked panicles, very abundant, and extremely showy; though

destitute of scent. Native of Mexico. Introduced in 1790, and now become very common in the English gardens, where, if planted against the front of a green-house; it will stand the cold of our ordinary winters.

2. *BOUVARDIA JACQUINII* (sharp-leaved Bouvardia). Bot. Reg. t. 107. *Leaves oblong, smoothish, about three in a whorl, under side hairy.*—It is a Native of Mexico, is very subject to damp; but being partly herbaceous the root is most frequently preserved although the upper part has perished. Though it requires the protection of a green-house in winter, it may be made an ornamental plant for the flower borders in autumn; by putting single cuttings in small pots filled with rich earth, into the heat of a hot-bed, early in March, they will be fit to transplant into the open ground the latter end of June, and will flower about August, continuing to blossom till destroyed by frosts; or if taken up and put into large pots, will flower to Christmas. Introduced 1794.

3. *BOUVARDIA VERSICOLOR* (various coloured Bouvardia). Bot. Reg. t. 245. *Leaves opposite; corolla clavate; tube smooth inside.*—An upright shrub, two to three feet high, with a hardish wooded stem, covered with a light brown bark, and branched. Flowers nodding, turning from deep yellow to a deep red, scarcely exceeding an inch in length, without scent. They appear from July to September. It requires to be kept in the warmest part of the green-house. Increased by cuttings, which require bottom heat; soil a mixture of loam and peat. Native of South America. Introduced 1814.

BOWDICHIA (in honour of J. E. Bowdich, who was sent on a mission to Ashantee in western Africa).

Class Decandria Monogynia. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx five-toothed; petals 5; free, disposed in a papilionaceous manner; stamens 10 free; legume compressed, membranous, winged; many seeded.*

BOWDICHIA VIRGILIOIDES (virgilialike Bowdichia). *Leaflets 13; lanceolate oblong, obtuse at both ends.*—An unarmed tree. Native of South America, near Barbula, and at the mouth of the Orinoco, where it is commonly called *Alcornoco*. Flowers violaceous. It makes a pretty appearance, thriving

well in a mixture of loam, peat, and sand. It may be increased by cuttings with leaves on, taken off at a joint, and planted in sand, with a hand-glass placed over them in a moist heat.

BOWLESIA (in honour of W. Bowles, an Irish botanist).

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Fruit ovate, quadrangular, bristly, concave at the back; umbel simple.*

1. *BOWLESIA TENERA* (slender Bowlesia). *Stems procumbent, slender; leaves reniform, five-lobed; lobes obtuse, mucronate.*—Native of Chili. Flowering from June to August. Peduncles short, bearing a three-flowered umbel each. Introduced 1827.

2. *BOWLESIA INCANA* (hoary Bowlesia). Fl. Per. t. 268. A. *Leaves reniform, roundish.*—A procumbent plant; hoary; umbels axillary. Native of Peru. Introduced 1828.

3. *BOWLESIA LOBATA* (lobed-leaved Bowlesia). Fl. Per. t. 251. B. *Leaves lobed, ribbed, abrupt at the base; lobes entire, pointed; footstalks axillary, mostly solitary; tendrils none.*—Native of the loftiest mountains of Peru. Herb slender, green, with some scattered starry pubescence. Leaves opposite, an inch broad, half an inch long, on slender zigzag footstalks. Flowers cream-coloured. Fruit in pairs, solid, ribbed at the back, clothed with starry hairs. Introduced 1828.

CULTURE.—The numerous species of this genus are weak, South American herbs. They may be increased by seeds, which require to be sown on a hot-bed in spring.

BRABEJUM (from a sceptre. The elegant racemes of its splendid flowers may well be compared to a sceptre).

Class Polygamia Monœcia. Nat. Ord. *Proteaceæ*.

The Characters are—*Hermaphrodite; corolla four-parted; stamens 4; style two-fid; drupe roundish; seed globular; male; corolla four-parted; stamens 4; style two-fid, abortive.*

BRABEJUM STELLATIFOLIUM (common African Almond). Brey. Cent. t. 1. *The only species.*—The star-leaved African almond is a native of the Cape of Good Hope. In Europe it seldom grows above eight or nine feet high, but in its native soil is a tree of a middling growth. It rises with an upright

standing on very short footstalks. The flowers are produced towards the end of their shoots, of a pale colour inclining to white. It may be propagated, though with difficulty, by layers made in April. In winter they should have a good greenhouse; but in summer they should be placed abroad in a sheltered situation. Introduced 1731.

BRACHYCARPÆA (from *brachy*, short, and *karpos*, a fruit).

Class *Tetradynamia Siliculosa*. Nat. Ord. *Cruciferae*.

The Characters are—*Silicle didynamous, with a very narrow dissepiment, very ventricose valves, one-seeded cells, and a short style*.

BRACHYCARPÆA VARIANS (varying *Brachycarpæa*). Deless. t. 200. *Leaves oblong-linear*.—This curious, little, smooth, twiggy shrub is a native of the Cape of Good Hope. The flowers are large, and vary from yellow to purple. It thrives well in a mixture of sand, loam, and peat; and may be increased by young cuttings, which root readily in sand under a hand-glass. Introduced 1829.

BRACHYLENA.

Class *Syngenesia Polygamia Superflua*. Nat. Ord. *Compositæ*.

The Characters are—*Calyx imbricate, cylindric; down simple; receptacle naked*.

BRACHYLENA NERIIFOLIA (oleander-leaved *Brachylæna*). *Leaves oblong, serrate in the upper part, with one or two toothlets*.—The stalk is shrubby, soft, and rises to the height of ten feet, putting out side branches towards the top. The flowers are produced at the extremity of the branches in a close spike; they make little appearance, being of an herbaceous colour, and are not succeeded by seeds in England.

It is difficult to propagate, for the cuttings will seldom take root. In Holland they lay down the entire head of young plants, slitting the smaller branches, in the same manner as is practised for carnations, laying them in the ground, and forking each down to prevent their rising; these, when duly watered, will put out roots in one year, when they may be taken off, and plant-

Cape of Good Hope. Introduced 1752.

BRACHYPODIUM.

Class *Triandria Digynia*. Nat. Ord. *Gramineæ*.

The Characters are—*Spikelets stalked, alternate in each tooth of the rachis; scales pilose*.

1. **BRACHYPODIUM PINNATUM** (spiked heath *Brachypodium*). Eng. Bot. t. 730. *Spikes simple, distichous, erect; beard shorter than its valve*.—This grass is found on open commons or heaths in a free-stone soil; not unfrequently in Yorkshire, Oxfordshire, and Kent, but rarely elsewhere. It is perennial, and flowers in June. From its firmness and rigidity it is quite unfit for the use of cattle.

2. **BRACHYPODIUM LOLIACEUM** (spiked sea *Brachypodium*). Eng. Bot. t. 221. *Spike simple, compressed; florets beardless*.—It occurs on the sandy beach in many parts of England. Flowering about midsummer.

3. **BRACHYPODIUM SYLVATICUM** (wood *Brachypodium*). Eng. Bot. t. 729. *Raceme spiked, distichous, simple, nodding; upper beard longer than glume*.—Frequent in copses and thickets by the side of shady lanes, more especially on a gravelly or sandy soil. Flowering in July, when its slender form, rising above the surrounding herbage, renders it conspicuous. It becomes still more so in the latter part of summer, by assuming a yellowish or tawny hue, especially in the lower leaves.

CULTURE.—The numerous species of this genus being of no agricultural use, are not worth cultivating. They are increased readily by seeds.

BRACHYSEMA.

Class *Decandria Monogynia*. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx five-cleft with a ventricose tube; standard shorter than the compressed keel, which is as long as the wings; ovary with a stalk, surrounded at base by a little sheath; style filiform, long*.

1. **BRACHYSEMA LATIFOLIUM** (broad-leaved *Brachysema*). Bot. Reg. t. 118. *Leaves ovate, flat; standard oblong, obovate*.—A small trailing, branching,

green-house shrub. The leaves are of a glaucous green above, white below, mid-rib prominent beneath, red, as is the margin of the leaf. Flowers very handsome, corolla crimson; vexillum twice shorter than the petals, with a streaked yellow disk. Native of New Holland. Flowering in April. Introduced 1803.

2. *BRACHYSEMA UNDULATUM* (wave-leaved *Brachysema*). Bot. Reg. t. 642. *Leaves elliptical wavy, mucronate; standard oblong, cordate.*—A handsome shrub, stem upright, with divaricate branches, leaves smooth and opaquely green above, silky and white underneath. Flowers pendulous, palish-yellow. It succeeds in the green-house, where it flowers in March and April. Native of New South Wales. Introduced 1820.

CULTURE.—The species of this genus may be increased readily either by layers, cuttings in sand, or by seed.

BRACHYSTELMA.

Class Pentandria Digynia. Nat. Ord. *Asclepiadæ*.

The Characters are—*Corolla campanulate with angular recesses; column included; crown 1-leaved, five-cleft with the lobes opposite the anthers, simple at back; pollen masses erect, inserted at the base.*

1. *BRACHYSTELMA TUBEROSUM* (tuberous rooted *Brachystelma*). Bot. Reg. t. 722. *Leaves opposite, membranous, concave, ciliate at the edge and keels.*—The tuber is round, stem sub-shrubby, branching. Branches round. Flowers partly collected in whorls with three or four flowers in each branch nearly of the size of those of *Stapelia reclinata*, to which it bears a strong resemblance. Corolla greenish on the outside, dotted with red; inside black-purple, centre deep yellow with broken cross lines. The flowers emit a nauseous stench.

2. *BRACHYSTELMA SPATULATUM* (spatulate-leaved *Brachystelma*). Bot. Reg. t. 1113. *Leaves spatulate, obtuse.*—A native of the Cape of Good Hope. Tuber roundish, stem a foot high, fleshy. Leaves two inches long. Flowers campanulate, dull purple, dotted, with erect segments twice as long as the tube. Introduced 1824.

3. *BRACHYSTELMA CRISPUM* (wave-leaved *Brachystelma*). Bot. Mag. t. 3016. *Leaves elliptic-lanceolate.*—Tuber four inches in diameter; stems se-

veral ascending, much branched. The flowers, which are of a peculiarly fœtid smell, are monopetalous; limb five-part ed; segments with their edges revolute, upper surface dark olive-green; faux-yellow, with purplish-brown spots. Native of Southern Africa. Introduced 1829.

CULTURE.—Dr. Lindley recommends, in order to grow the plants of this genus in perfection, that they should be planted in old rubbish, and kept in a hot dry stove, where they will flower readily in the months of June and July. In flowering the stems will lie down; the pots should then be removed to a place where they may be kept free from damp, until the ensuing spring.

BRADLEJA.

Class Monœcia Monadelphia. Nat. Ord. *Euphorbiacæ*.

The Characters are—*Corolla six-parted, filaments 3, with three twin anthers; stigma 6, capsule six celled, six valved, seed solitary.*

BRADLEJA SINICA (Chinese *Bradleja*). *Leaves lanceolate.* A shrub, native of China, with leaves resembling the *Annonia*, but not of a lucid surface. The fructifications proceed from the axils of the leaves, they appear in August and September. The fruits, or seed vessels, are compressed, small, orbicular, striated, and hard. Introduced 1816.

CULTURE.—The species of this genus are readily increased by seed, which require only a common stove culture.

BRASSAVOLO (named in honour of A. M. Brassavolo, an Italian botanist).

Class Gynandria Monandria. Nat. Ord. *Orchidæ*.

The Characters are—*Calyx and petals distinct, spreading; lip undivided, with a simple claw; anther a terminal lid: pollen masses eight or more.*

1. *BRASSAVOLO CUCULLATA* (single-flowered *Brassavolo*). Bot. Mag. t. 543. *Stem nearly single-flowered; lip fringed.*—The stem is simple, about a span high, sheathed with a few scales, and crowned with one, rarely two, long, very narrow, keeled, fleshy leaves, and as many large, white, long-stalked, nearly scentless, but very elegant flowers; their drooping calyx and petals two or three inches long, surrounding the long pointed, curiously fringed lip. Native of the West Indies. It flowers in the stove from June to September. Introduced 1793.

2. *BRASSAVOLA TUBERCULATA* (tuberculated *Brassavola*). Bot. Mag. t. 2378. *Lip very large, not fringed*.—A native of the trunks of trees, in rocky places, at the entrance of Bofafogo Bay, Brazil. In habit it very much resembles *B. cucullata*, but it differs remarkably in the form and colour of the flower, and in the want of fringe. The flowers are of a yellowish-green, the three outer petals, blotched externally with purple. It flowers in July. Introduced 1826.

CULTURE.—The species of this genus are cultivated without difficulty in peat and sand, if good decomposed wood is not to be procured. They may be increased readily by dividing the roots.

BRASSIA.

Class Gynandria Monogynia. Nat. Ord. *Orchideæ*.

The Characters are—*Lip expanded, undivided, sepals spreading, distinct; column not winged; pollen masses 2, two-lobed behind; fixed by the middle to a common process of the stigma.*

1. *BRASSIA MACULATA* (spotted *Brassia*). Bot. Mag. t. 1691. *Sepals lanceolate, spreading, not longer than ovary*.—A large and very handsome plant with broad sheathing coriaceous leaves, and a cluster of large flowers, whose calyx and petals are green, the broad lip white, all most beautifully and variously spotted with purple. Native of the West Indies, flowering in June and July. Introduced 1806.

2. *BRASSIA CAUDATA* (long-tailed *Brassia*). Bot. Reg. t. 832. *Sepals linear-lanceolate, acuminate, the lower caudate very much longer than ovary*.—A very handsome and curious plant from the west Indies. The flowers are of a yellowish-green, elegantly spotted with brown, with very long tails to their lower segments. The flowers appear in June and July. Introduced 1823.

CULTURE.—The species of this genus may be increased sparingly by dividing the root; they require the same treatment as the *Air* plants.

BRASSICA.

Class Tetradinamia Siliquosa. Nat. Ord. *Cruciferae*.

The Characters are—*Siliques roundish; style small, short, obtuse; seeds in one row; calyx closed.*

BRASSICA OLERACEA (common Cabbage). Eng. Bot. 637. *Leaves covered with glaucous pollen, somewhat fleshy, lobed even in their youngest*

state, or repand.—The cabbage is found in its wild state on the sea-shores of Britain, especially about Dover Cliffs; it is a biennial plant, and has the stem-leaves very much waved, and variously indented; the colour sea-green, frequently with a mixture of purple; the lower ones somewhat ovate and sessile; the upper almost linear. The flowers are large; the leaflets of the calyx ovate, broad, and yellow; the siliques short and swelling.

Early in the spring, the *sea-cabbage* is preferable to the cultivated sorts; but when it is gathered on the coast, it must be boiled in two waters, to take away the saltness. When old it is said to occasion giddiness. The roots may also be eaten, but they are not so tender as those of the turnip and navew. All the different varieties of garden cabbage originate in this.

These varieties may, it should seem, be reduced to three general divisions: the *first* comprehending those which grow in the natural way, without forming the leaves or stalks into a head. This section or division, besides the *sea-cabbage* or *wild colewort*, would comprehend the *green colewort*, the *borecoles*, and *turnip cabbage*. *Secondly*, those which form the leaves into a head, as the *white cabbage*, the *red*, the *savoy*, &c. *Thirdly*, those which form their stalks into a head, as the *cauliflower*, and the different varieties of *broccoli*. The first section might be subdivided into the wild, with broad leaves, and an even stem; the turnip cabbage, with broad leaves, and a protuberant stem; and the borecoles, with fine-cut leaves, and an even stem. The second section contains the cabbages commonly so called: as the red; the numerous varieties of the white, such as the sugar-loaf, the early, the foreign musk, the small Russia, the large-sided, the flat-topped, the Yorkshire, Scotch, American, &c. &c.; and those with wrinkled leaves, as the common savoy, &c. Of the borecoles in the first, and the broccoli in the third section, there are also variations in colour, the purple and the white.

There is scarcely an instance in the vegetable kingdom of a plant that produces varieties so different in appearance and qualities as the *B. oleracea*. Comparing the original plant with the cauliflower, the difference is astonishing.

The common colewort, or Dorsetshire kale, is now almost lost near London, where the markets are usually supplied with cabbage-plants instead of them; these being more tender and delicate. The common colewort, indeed, is better able to resist the cold in severe winters; but it is not good till it has been pinched by frost; and our winters being generally temperate, cabbage-plants are now constantly brought to market; which, if they are of the sugar-loaf kind, are the sweetest greens from December to April yet known, the variegated kale excepted.

The curled coleworts or borecoles are more generally esteemed than the common one, being, like that, so hardy as never to be injured by cold, and at the same time much more tender and delicate: these, however, are always sweeter in severe winters than in mild seasons.

Of the heading cabbages, the red is chiefly cultivated for pickling; the common white, flat, long-sided, and savoy, for winter use. The musk cabbage is almost lost, though for eating it is one of the best we have.

The early York and sugar-loaf cabbages are generally sown for summer use, and are commonly called Michaelmas cabbages. The Russian cabbage was formerly in much greater esteem than at present, it being now only to be found in particular gentlemen's gardens, and rarely brought to market. The other heading cabbages, together with many others, for it would be endless to enumerate all the varieties which are perpetually rising into fame, and falling into oblivion, are cultivated chiefly for feeding cattle; for which they are certainly very well adapted on strong lands; but they are undoubtedly a very exhausting crop. See page 208.

The cauliflower was first brought to England from the island of Cyprus, where it is in great perfection at present; but it is supposed it was originally brought thither from some other country; most of the old writers mention it to have been brought from that island to the different parts of Europe. Although this plant was cultivated in a few English gardens long since, yet it was not brought to any degree of perfection till about the year 1680, at least not to be sold in the markets. Since the year 1700, the cauliflower has been

so much improved in England, that such plants as before would have been greatly admired, are at present little regarded. It has indeed been much more improved in England than in any other parts of Europe. In France they rarely have cauliflowers till near Michaelmas; and Holland is generally supplied with them from England. In many parts of Germany they were not cultivated till within a few years past; and most parts of Europe are supplied with seeds from hence.

Purple and white broccoli are only varieties of the cauliflower; for although with care they may be kept distinct, yet if they were to stand near each other for seed, they would probably intermix. When, however, these are cultivated with care, they may be kept distinct. The variations are not occasioned by soil, but by the mixture of the farina of the anthers in the flowers; those persons, therefore, who are curious to preserve them distinct, never suffer the different sorts to stand near each other for seed.

CULTURE.—The varieties of *B. oleracea* have been cultivated from the earliest period. The Saxons named the month of February sprout-kale.

These varieties are reduced by M. Decandolle to six general divisions:—

1. Comprehending the cabbage, as found in its wild state.
2. Greens, kale or borecoles.
3. Savoy-cabbages, and Brussels sprouts.
4. Cabbages, red and white.
5. Chou rave, or turnip stemmed cabbage.
6. Cauliflower and broccoli.

They all prefer a loamy soil, well enriched with manure; and manures of the strongest kinds, as night soil, offals from the shambles, blood, &c. are not found too powerful for common cabbage or cauliflower.

Borecole is raised from seed, and for a seed-bed of fifty feet square half an ounce is sufficient. The seed should be sown the first week in April for a principal crop of German kale, and the first week in August for the crop of Buda kale, and which will be ready to transplant in September.

Subsequent culture.—When the plants have leaves one or two inches broad, take out some from the seed-bed, and prick into other open beds, six inches

apart, giving water, in which let them have four or five weeks' growth. Those left in the seed-bed, as well as these, will all acquire proper strength for final transplanting in May, or thence till August. Plant them in an open spot in rows two feet and a half asunder, for the first forward planting in summer, the other two feet, allotting the whole similar distances in the rows, taking advantage of moist weather, but give occasional watering if the weather is dry, until they have struck root. In their advancing growth hoe once or twice to cut down the weeds, and to draw earth about the bottom of their stems to encourage their growth, in the production of large full heads in proper season, in September, October, &c.

At the approach of winter the stems should be earthed up, especially the taller sorts, to help to support them against rough beating weather. If disturbed by the wind, set them upright.

The *borecoles* are never eaten till frost has rendered them tender; for before that they are tough and bitter. They will be fit to use after Christmas, and continue good to April.

All these plants bear our severest winters, are a useful reserve for the table in such seasons, and then eat very sweet and tender.

Green borecole is also a very useful green food for sheep, because it is not only hardy, but growing three feet high it may at all times in deep snows be got at by these animals, who frequently suffer much from want of food in such cases. It may be cultivated exactly as is directed above.

SAVOY, for cultivation. See SAVOY.

CABBAGE, red and white, and turnip-stemmed, for cultivation. See p 208. and CABBAGE.

CAULIFLOWER and BROCCOLI, for cultivation. See CAULIFLOWER.

There are several other species in this genus, natives of different parts of the globe; but they have no beauty or utility to recommend them for cultivation in this country.

BRAWN, the flesh of a boar soured or pickled; for which end the boar should be old; because the older he is, the more horny will the brawn be.

The method of preparing brawn is as follows: the boar being killed, it is the flitches only, without the legs, that are made brawn; the bones of which are

to be taken out, and then the flesh sprinkled with salt, and laid in a tray, that the blood may drain off; then it is to be salted a little, and rolled up as hard as possible. The length of the collar of brawn, should be as much as one side of the boar will bear; so that when rolled up, it may be nine or ten inches diameter.

The collar thus rolled up, is boiled in a copper, or large kettle, till it is so tender, that a straw can be run through it: then it is set by, till it is thoroughly cold, and put into the following pickle. To every gallon of water, put a handful or two of salt, and as much wheat bran: boil them together, then drain the bran as clear as you can from the liquor: and when the liquor is quite cold, put the brawn into it.

BRAYA (in honour of Count Gabriel Bray, a Bavarian nobleman and botanist).

Class Tetradymania Siliquosa. Nat. Ord. *Cruciferae*.

The Characters are—*Siliques oblong, subcylindrical, with flattish valves, and sessile stigma; seeds few, ovate; calyx equal at base.*

BRAYA ALPINA (Alpine Braya). Deless. t. 22. *Leaves linear, narrowed at base, smooth, acute.*—A curious little plant. Racemes terminal. Flowers purple. A native of the Corinthian Alps. Flowering in April and May. Introduced 1821.

CULTURE.—The species of this genus are pretty little Alpine plants; propagated by dividing the plants at the root or by seed; and treated as other Alpine plants.

BREXIA.

Class Pentandria Monogynia. Nat. Ord. *Brexiaceae*.

The Characters are—*Calyx of one piece, five-cleft, permanent; petals 5, rounded, caducous; filaments united at the base, so as to form a kind of basin or urceolus, fringed at the intervals; germen conical; style short; stigma thick.*

1. BREXIA SPINOSA (spiny leaved Brexia). Bot. Reg. t. 872. *Leaves lanceolate, long, spiny, toothed.*—A tree twenty feet high. Native of Madagascar. With us it is a stove plant, with firm leaves, and axillary green flowers, which are produced in June. Introduced 1812.

2. BREXIA MADAGASCARIENSIS (Mada-

gascar Brexia). Bot. Reg. t. 730. *Leaves obovate, entire.*—A tree twenty feet high, with yellowish green flowers. Native of Madagascar. Flowering in June. Introduced 1812.

CULTURE.—The species of this genus are beautiful trees with elegant foliage. They are increased readily by cuttings with their leaves on, which strike root freely in sand with a hand-glass over them in heat.

BRIDELIA.

Class Polygamia Monœcia. Nat. Ord. Euphorbiaceæ.

The Characters are—*Flowers monœcious, calyx five fid; petals 5, minute; stamens with a tubular style two, divided berry: two-celled one-two-seeded.*

1. **BRIDELIA SCANDENS** (climbing Bridelia) Rox. Cor. t. 173. *Leaves oblong, acute, tomentose beneath.*—Common on the banks of rivers and water-courses. The trunk scarcely any. Branches long and climbing. Flowers axillary, small, yellowish-green. Berry oblong, juicy, smooth, size of a large French bean, and when ripe it is of a rusty black colour. Native of Coromandel.

2. **BRIDELIA MONTANA** (mountain Bridelia) Rox. Cor. t. 171. *Leaves oblong, obtuse, glabrous.*—A small tree, with numerous spreading branches. Flowers axillary, small, of a greenish colour. The berry is globular, succulent, size of a pea. The wood is very hard and of a reddish-colour. Native of the East Indies.

3. **BRIDELIA FRUTICOSA** (frutescent Bridelia) Rox. Cor. t. 172. *Leaves oblong, acute, glabrous.*—A middle sized tree with spreading branches. Flowers greenish-yellow, collected in bundles, leaving the insterstices naked. Berry size of a pea, globular, black. The bark is a strong astringent. The wood is dark-coloured, hard and durable. Native of the East Indies.

BRIZA.

Class Triandria Digynia. Nat. Ord. Gramineæ.

The Characters are—*Glumes navicular, compressed, nearly cordate at the base, many flowered 13-17; shorter than the florets which are imbricate in two rows; seed with two filiform beaks.*

1. **BRIZA MINOR** (small Quaking-grass). Eng. Bot. t. 1316. *Panicle erect; spikelets three-angular, 5-7 flowered; glume larger than florets.*—The

small quaking-grass is annual. The culms are a foot in height, and the panicles are very much branched. Native of France, Italy, and Britain; flowering from June to August.

2. **BRIZA MEDIA** (common Quaking-grass). Eng. Bot. t. 340. *Panicle erect, spikelets finally cordate, about 7-flowered; glume longer than florets.*—This beautiful grass is very common in pastures, especially dry ones, in most parts of Europe, and is easily distinguished by the continual shaking of the spikelets. Hence most of its common English names, as well as that by which it was known among old authors—*Gramen tremulum*. The French call these quaking-grasses *Amourettes*. It flowers from May to July.

Cattle eat it, both green, and made into hay with other grasses, but it has no peculiar excellence that we are acquainted with. nor has it ever been cultivated separately. Indeed it furnishes very little food, and generally indicates a poverty of soil.

3. **BRIZA MAXIMA** (great spiked Quaking-grass). Fl. Gr. t. 76. *Panicle nodding at end; spikelets oblong cordate 13-17 flowered.*—It is an annual root, sending up many broad hairy leaves, between which arise slender stiff stalks, from a foot to near two feet high, dividing at top into a large loose panicle. Native of the South of Europe. Introduced 1633.

CULTURE.—If the seeds of these be permitted to scatter, or else be sown in the autumn, the plants will come up stronger, and flower much earlier, than when they are sown in the spring.

BROCOLI. (See Cauliflower).

BRODIAEA.

Class Triandria Monogynia. Nat. Ord. Hemerocallideæ.

The characters are—*Flowers campanulate six-parted; filaments inserted into the throat; ovary stalked; capsule three-celled, with many seeds.*

1. **BRODIAEA GRANDIFLORA** (large flowered Brodiaea). Bot. Reg. t. 1183. *Scales of the corolla undivided, partial stalks longer than the flowers.*—It is a beautiful hardy plant, native of New Georgiana. The root is bulbous, solid. Leaves two, radical, linear, channelled, near a foot long. Flower stalk solitary, bearing an unequal bracteated umbel, of upright, handsome blue flowers, each near an inch long, with yellowish scales

flowers.—A curious little plant. Native of Georgia. The flowers are rather numerous, smaller than the *grandiflora*, and form a dense head, subtended by bractæ; flowering in May. Introduced 1806.

CULTURE.—The species of this genus grow freely in a peat border and are readily increased by seed which they produce in small quantities.

BROMELIA.

Class Hexandria Monogynia. Nat. Ord. Bromeliaceæ.

The Characters are—*Calyx three-lobed, petals 3; a honey bearing scale at base of petal; berry three-celled.*

1. **BROMELIA PINGVIN** (broad-leaved Bromelia). *Leaves ciliated, spiny mucronate; raceme terminal*.—The leaves of the *Pinguin* are very thick about the root; and from the centre of these springs the stalk, which generally rises to the height of twelve or sixteen inches above the foliage, and divides into many little lateral branches, bearing so many single flowers. When the plant begins to shoot into blossom, all the leaves become of a fine scarlet colour towards the stalk, and continue so until the fruit begins to ripen, but it then begins to change, and afterwards fades gradually away. The fruits are separate, each nearly the size of a walnut; the pulp has an agreeable sweetness, but joined with such a sharpness, that it will corrode the palate and gums, so as to make the blood ooze from those tender parts.

This plant, having a tuft of leaves growing above the fruits, has the appearance of the Pine-Apple; but on a closer inspection, the difference is easily discerned, the fruits not being conduplicate as in that, but produced separately in clusters.

It is now very common in Jamaica, growing wild in most of the Savanas and on the rocky hills. It is commonly used there, and in the other islands of the West Indies, for fencing pasture lands, its leaves being very formidable to cattle, the edges being very prickly, and the prickles arched backwards. These stripped of their pulp, soaked in water, and beaten with a wooden mallet, yield a strong thread, which is twisted

fruit in water, makes an admirable cooling draught in fevers; destroys worms in children, cleanses and heals the thrush, and other ulcerations in the mouth and throat; and is extremely diuretic; it also makes a very fine vinegar.

The *Pinguin* was cultivated in the Eltham Garden; and before that in 1690, in the Royal Garden at Hampton Court.

2. **BROMELIA KARATA** (upright leaved Bromelia). *Leaves erect, flowers stemless, sessile, aggregate*.—This species generally grows at the root of some shady tree, in hilly and woody places in America and the Caribbee islands. It is an elegant plant, producing numerous radical leaves, which are of a subulate-linear shape, sharp pointed, and edged with spines. The flowers are scentless, seated in the bosom or middle part of the plant, rose-coloured, with the calyx and germ downy. The length of leaves is six or seven feet. The fruits are oval, two or three hundred in number, and grow sessile in a heap or central group, surrounded by palaceous expanded leaves or bractes; they contain a succulent whitish or yellowish flesh, under a coriaceous and yellowish bark. When ripe they are far from unpleasant, but when unripe they set the teeth on edge, and excoriate the mouth. The economy of this plant in the preservation of its fruit to maturity is wonderful: being so protected by the spines of the surrounding leaves, as to be secure from all injuries. It propagates itself by mucus produced amongst the leaves, which become precumbent, after the fruit is ripened.

3. **BROMELIA EXUDANS** (clammy Bromelia). Bot. Cab. t. 801. *Racemes compound; flowers heaped shorter than the long red entire bractes; calyx acute*.—A native of the West Indies, growing upon trees. The leaves are two feet long, and four inches broad, ending in a soft spinous point, the edges are beset with spines. The scape is not longer than the leaves, naked about two-thirds of its length, where the flowers begin; they form a branching raceme. Bractes large, red. The flow-

are numerous. They should be treated as common stove plants, and may be propagated by suckers, or from the crown of the fruit. The *Pinguin* and *Kurrulas* are propagated by seeds, for though there are often suckers sent forth from the old plants, yet they come out from between the leaves, and are so long, slender, and ill-shapen, that if they are planted they seldom make regular plants. These seeds should be sown early in the spring, in small pots filled with light rich earth, and plunged into a hot-bed of tanners' bark. When the plants are strong enough to transplant, they should be carefully taken up, and each planted into a separate pot filled with light rich earth, and plunged into the hot-bed again, observing to refresh them frequently with water, until they have taken new root, after which time they should have air and water in proportion to the warmth of the season. In this bed the plants may remain till Michaelmas, at which time they should be removed into the stove, and plunged into the bark-bed, where they should be treated in the same manner as the *Ananas*.

These plants will not produce their fruit in England until they are three or four years old, therefore they should be shifted into larger pots, as the plants advance in their growth; for if their roots are too much confined, they will make but little progress. They should also be placed at a pretty great distance from each other, for their leaves will be three or four feet long, which turning downward occupy a large space.

The leaves are strongly armed with crooked spines, which render it very troublesome to shift or handle the plants; for being some bent one way, and others the reverse, they catch both ways, and tear the skin or clothes of the persons who handle them, where there is not the greatest care taken.

Bromus.

Class Triandria Digynia. Nat. Ord. Gramineæ.

The Characters are—*Glume* three-twenty flowered, two valves shorter than the *florets*, which are imbricated in two rows; *Lower paleæ* cordate, emarginate

grass). Eng. Bot. 1078. *Panicle* erect, *spikelets* oblong, ovate, roundish; *pubescent*; *outer paleæ* bifid, *leaves* soft.—Soft Bromo-grass is a native of most parts of Europe, by way sides. On banks, in uncultivated places, on walls, in corn fields particularly among barley, in meadows and pastures especially in a dry sandy soil: flowering in May and June.

With us it forms a principal part of many mowing grounds. Mr. Curtis affirms, that it abounds in most of our best meadows; he remarks very justly that it springs early, and ripens its seeds about the time of haymaking; that the seed is large, each panicle containing nearly as much as a common oat: hence he observes, that although cattle may not be fond of the leaves and green panicle, yet that it may perhaps contribute to render the hay more nutritive. It has however a bad property, for the panicle is so heavy, that it is very apt to be laid by rain; it is also so much earlier than many other grasses, that by the ordinary time of mowing it is in a manner withered away, and what seeds have not fallen are lost in the making and carting: finally, the seeds are said to bring on a temporary giddiness in the human species and in quadrupeds, and even to be fatal to poultry; if this be in any degree true, it is an objection to the cultivation of this grass, which in other respects does not rank among the best kinds.

2. *BROMUS SECALINUS* (smooth rye Bromo-grass). Eng. Bot. t. 1171. *Panicle* in seed, nodding at end; *spikelets* ovate; *florets* at base distinct; *beard* hoary, shorter than *glume*; *leaves* nearly smooth.—*B. secalinus* is often found among rye and wheat crops, the seeds when ground among the flour are said to impart a bitter taste to bread, and to have similar narcotic qualities as *Lolium temulentum*. In Scania, the panicles are used to dye green; and there, as formerly in Britain, rye was supposed to degenerate into this grass.

CULTURE.—The species of this genus of grasses are numerous, and not well defined. Most of them are of a coarse quality, and being strictly annuals are

of little value as pasture, and as hay produce no after math. Sir H. Davy found that the nutritive powers of the straws and leaves of most of the species were greatest when the plant is coming into flower; because, like all other plants strictly annual, or which do not shoot up again from the root the same season, when left till the seed is ripe, the leaves and straws become dried up.

BRONGNIARTIA.

Class Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Legume compressed, four-eight seeded; semi-hispidous suture without any wing.*

BRONGNIARTIA PODALYRIOIDES (Podalyria-like Brongniartia). H, et. B. t. 589. *Leaves with four-five pairs of ovate elliptic acute leaflets.*—A shrub two feet high. Native of new Spain. The flowers are large, of a purple-colour, and make an elegant appearance. It thrives well in a mixture of loam, peat and sand. May be increased by cuttings which root readily in sand, with a bell-glass placed over them in heat.

BROSIMUM.

Class Polygamia Diœcia.

The Characters are—*HERMAPHRODITE; catkin globose with a solitary ovary at end; calyx a scale; corolla 0; anthers petals solitary; style two-fid. FEMALE calyx 0; corolla 0; ovary imbricated with scales; style two-fid; berry coated, one-seeded.*

1. *BROSIMUM ALCISTRUM* (Jamaica Bread-nut). *Leaves ovate lanceolate, ever-green; fruit coated.*—This tree is frequent in the parishes of St. Elizabeth and St. James in the island of Jamaica; and in both is computed to make up about a third part of the woods. The timber is not despicable; but the leaves and younger branches are more useful, and a hearty fattening fodder for all sorts of cattle. The fruit, boiled with salt-fish, pork, beef. or pickle, has been frequently the support of the negroes and poorer sort of white people, in times of scarcity; and proved a wholesome and no unpleasant food: when roasted, it eats something like our European Chesnuts, and is called *Bread-nut*. The leaves and younger shoots are full of gum, which renders them disagreeable to most cattle at first, but they soon grow very fond of them. Introduced 1776.

2. *BROSIMUM SPURSUM* (Milk-wood Bread-nut). *Leaves acuminate; fruit soft.*—Is called *Milk-wood*, and is pretty common in St. Mary's parish Jamaica. It rises to a considerable height in the woods, is reckoned among the timber trees, and is sometimes used as such though not generally valued. Introduced 1789.

CULTURE.—In our stoves, the species of this genus thrive well in a foamy soil. They may be increased by old cuttings with their leaves on, which root readily in sand, in moist heat.

BROTERA (named after F. A. Brotera, a Portuguese botanist).

Class Syngenesia Polygamia Segregata. Nat. Ord. *Compositæ*.

The Characters are—*Partial involucrem one-flowered, many leaved; common six-eight flowered, imbricated, many leaved; florets tubular, uniform; receptacle naked.*

BROTERA CORYMBOSA (umbelled Brotera). Mor. t. 33. f. 17. *Heads corymbose, numerous.*—The root is perennial. Stem single, white, smooth, putting out side branches. Leaves long, pale green, closely armed on their edges with short stiff spines, which come out double. Stems terminated by single oval scaly heads of white flowers, each scale terminated by a purplish spine; the scaly calyx is closely joined at the top, so that few of the florets appear visible above it, and it is guarded by a border of long narrow prickly leaves, rising considerably above the flowers; which appear from June to August. Native of the south of Europe. Introduced 1640.

CULTURE.—It is increased by parting the roots in the spring. In a light soil and warm situation it will live abroad in common winters, but in severe frosts it is sometimes destroyed.

BROUGHTONIA.

Class Gynandria Monandria. Nat. Ord. *Orchidæ*.

The Characters are—*Column distinct, or at the very base united with the unguiculate lip, which is lengthened at the base into a tube connate with the ovarium; pollen masses 4, with a granular caudiculate reflexed upon the masses.*

BROUGHTONIA SANGUINEA (Blood-coloured Broughtonia). Bot. Cab. t. 793. *Leaves twin, oblong, seated on a bulb; scape divided.*—This elegant

plant grows on trees and palisades in the woods of Jamaica, forming tufts of leaf-bearing bulbs, the leaves of light green, two inches long. Stalks radical, a foot high, with a few handsome corymbose, dark crimson flowers, of inmatchless brightness. Flowering in August.

CULTURE.—It requires to be kept constantly in the stove; flourishing well in a pot, in which are several pieces of wood, with vegetable soil and moss. It is increased with difficulty by dividing the roots.

BROUSSONETIA (named by L'Heritier, in honour of his countryman, P. N. V. Broussonet, a well known naturalist, who travelled in Barbary, and published an *Ichthyologia* in 1782).

Class *Dioecia* Tetrandria. Nat. Ord. *Urticæ*.

The Characters are—**MALE**; a cylindrical catkin; calyx four-parted. **FEMALE**; a globose catkin; calyx tubular, three-four toothed; ovaries becoming fleshy, obovate, prominent; style lateral; seed 1, covered by the calyx.

BROUSSONETIA PAPYRIFERA (common paper Mulberry). Bot. Reg. t. 488. *Leaves three-five lobed, acuminate, serrated, scabrous.*—Though a low tree it produces vigorous shoots, furnished with large leaves. The fruit is little larger than peas, surrounded with long purple hairs, when ripe changing to a black purple colour, and full of sweet juice. In China and Japan it is cultivated as we do osiers, for the sake of the young shoots, from the bark of which the inhabitants of the east countries make paper. The bark being separated from the wood is steeped in water, and the inner bark separated from the outer; the former making the whitest and best paper. The bark is next slowly boiled, then washed, and afterwards put on a wooden table and beaten into a pulp. This pulp being put in water, separates like grains of meal. An infusion of rice and the root of manihot is next added to it. From the liquor so prepared, the sheets of paper are poured out one by one, and when pressed, the operation is finished.

The juice of this tree is sufficiently tenacious to be used in China as a glue, in gilding either leather or paper. The finest and whitest cloth worn by the principal people at Otaheite and in the Sandwich Islands is made of the bark

of this tree. The cloth of the Bread-fruit tree is inferior in whiteness and softness, and worn chiefly by the common people. Native of Japan. Introduced 1751.

CULTURE.—The species of this genus are increased readily by cuttings, which strike root freely in common garden mould.

BROUNONIA (named in honour of R. Brown, D. C. L., author of *Prod. Fl. N. H.*, and justly considered the first botanist in the world).

Class Pentandria Monogynia. Nat. Ord. *Goodeniæ*.

The Characters are—*Corolla funnel-shaped, five-cleft, irregular; stigma with a bivalve sheath; seed one, crowned with the feathery-crowned inner calyx.*

1. **BROUNONIA SERICEA** (silky Brounionia). Lin. Trans. 10. t. 28. *Leaves silky, with close adpressed hairs; segments of the calyx with naked coloured tips.*—It differs from *Australis* in having narrower, more numerous, silky leaves, and the flowers differ remarkably in the blunt, coloured, naked points of their inner calyx. Native of New Holland.

2. **BROUNONIA AUSTRALIS** (Australian Brounionia). Lin. Trans. t. 28. *Leaves clothed with spreading hairs; segments of the calyx feathery all over.*—The root is simple, slender. Leaves radical, numerous, two or three inches long. Flower-stalks radical, solitary, a foot high, each bearing a head of numerous blue flowers, not unlike *Jasione montana*, but rather larger. Native of New Holland. Flowering in January. Introduced 1804.

CULTURE.—The species of this genus grow freely in a mixture of turfy peat, loam, and sand. They are increased by cuttings, which root freely in the same kind of soil, with a hand-glass placed over them.

BROWALLIA.

Class Didynamia Angiospermia. Nat. Ord. *Scrophularinæ*.

The Characters are—*Calyx five-toothed; corolla closed by the prominent orifice; two of the anthers larger than the others; capsule one-celled.*

1. **BROWALLIA ELATA** (upright Browallia). Bot. Mag. t. 34. *Peduncles 1, many flowered.*—It rises about the same height as the *demissa*, but has stronger stalks, and sends out a greater number of branches, it is therefore much more bushy. The flowers are produced on

axillary peduncles, some sustaining one, others three or more flowers, of a dark blue colour. The brilliancy of the colours of the corolla, we cannot do justice to by any colours we have. Native of Peru. It flowers in August. Introduced 1768.

2. *BROWALLIA DEMISSA* (spreading Browallia). Bot. Mag. t. 1136. *Peduncles one-flowered*.—This usually grows about two feet high, and spreads out into lateral branches, with oval entire leaves, ending in a point, and on short petioles. Toward the end of the branches the flowers are produced singly upon long axillary peduncles. The corolla is crooked and bent downward, the top of the tube is spread open, and the brim has some resemblance to a labiate flower. It is of a bright but pale blue colour, sometimes inclining to a purple or red; and often there are flowers of three colours on the same plant.

CULTURE.—As both species of *Browallia* are annual plants, they must be raised from seeds, which are to be sown on a hot-bed; but these may be transplanted in June into the borders of the flower-garden; where, if the season prove warm, they will flower and perfect seeds; but lest these should fail, there should be two or three plants kept in the stove for that purpose.

BROWNEA (after P. Browne, M. D. author of the history of Jamaica).

Class Monadelphia Decadecandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx tubular, bifid; corolla double, outer five-fid, inner of five petals; legumen one-celled*.

1. *BROWNEA COCCINEA* (scarlet Brownea). *Stamens length of corolla; peduncles aggregate; branches smooth*.—This is a shrub or small tree, growing to the height of about eighteen feet. The wood is covered by an ash-coloured bark. When in flower it has a beautiful appearance. The leaves are oval, entire, smooth, opposite, with short footstalks: they grow two or three pairs on a spray. The flowers grow about ten together, and are pendulous. The calyx is ferruginous, the corolla scarlet, and the stamens yellowish. This species grows in hilly and woody places in America. Flowering in July and August. Introduced 1793.

2. *BROWNEA ROSEA* (rose Brownea).

Flowers aggregate in heads, sessile; stamens very long.—This is also an American shrub or small tree, with an ash-coloured bark, opposite leaves, which are entire and smooth on both sides. The flowers are borne in a kind of aggregate manner, so as to form heads or bunches of the size of one's fist. They are red and make a very beautiful appearance. The stamens are extremely long. It grows principally in hilly situations. Flowering in August. Introduced 1820.

CULTURE.—The species of this genus are very splendid when in bloom, flourishing well in a mixture of loam, peat, and sand. They do not require much water in winter. Increased by ripened cuttings, planted in sand with a hand-glass over them, in a moist heat.

BROWNLAWIA (dedicated to the memory of the late Lady Brownlow).

Class Polyandria Monogynia. Nat. Ord. *Fittacææ*.

The Characters are—*Calyx five-parted; petals 5, with five linear scales round the stigma; stamens numerous; style crowned by a three-lobed stigma; capsule of 1 to 5, two-valved, one-two seeded carpels*.

BROWNLAWIA ELATA (tall Brownlowia). Rox. Cor. t. 265. *Leaves alternate, petioled, three-seven nerved, cordate*.—This truly majestic tree, attains a great size, that of full grown trees in their native soil measuring about fifteen feet in circumference. Branches numerous, spreading, forming a very large, ovate, shady head. Leaves from four to twelve inches long, three to eight broad. Flowers numerous, not fragrant, but pretty large and showy, of a bright yellow colour. Native of the East Indies. Introduced 1823.

CULTURE.—Increased by cuttings which root readily in sand under a hand-glass in heat. A mixture of loam and peat suits the tree best.

BRUCEA (in honour of Jathres Bruce the celebrated traveller in Abyssinia).

Class Diœcia Tetrandria. Nat. Ord. *Rutacææ*.

The Characters are—*MALE; calyx four-parted; petals 4; disk four-lobed. FEMALE; pericarps 4, one-seeded*.

BRUCEA FERRUGINEA (ferruginous Brucea). Bruce. t. 69. *Leaves opposite, stalked, pinnated with an odd one of five or six pairs*.—It seems to be the

only plant which Mr. Bruce brought from that almost inaccessible country (Abyssinia), although several very fine ones are represented in his travels.

He thus imperfectly describes it. "Leaf pinnate: leaflets oblong, pointed, smooth, and without collateral ribs that are visible; the upper side of a deep green, the reverse very little lighter, opposite, with a single one at the end. They are somewhat fetid when rubbed. The flowers come chiefly from the point of the stalk, on each side of a long branch; they are of an herbaceous colour tinged with red or russet."

It is a native of Abyssinia, where it is known by the name of *Wooginoos*. The root is a specific in the dysentery. It is a plain simple bitter, without any aromatic or resinous taste; leaving in the throat or palate something of roughness, resembling *Ipecacuanha*.

It grows pretty freely in the stove, potted in loam and peat earth. Flowering in December. It may be increased by cuttings. Introduced 1775.

BRUGMANSIA

Class Pentandria Monogynia. Nat. Ord. *Solanææ*.

The Characters are—*Capsule unarmed; calyx bursting at side, persistent; corolla funnel-shaped; anthers glued together; stigma or line running down each side of style.*

BRUGMANSIA CAUDATA (downy stalked *Brugmansia*). Fl. per. t. 128. *Leaves oblong, entire, powdery; stalks and branches pubescent; calyx spatheaceous, acuminate.*—It is one of the greatest ornaments of the gardens of Chili. The flowers which come out at the divisions of the branches, have a loose tubular calyx nearly four inches long, which, opening like a spathe, a corolla is protruded, with a narrow trumpet-shaped tube, which spreads wide at the brim, where it is divided into five angles, which terminate in very long points: they are white within, pale yellow outside, and one tree will perfume the air of a large garden. It flowers freely in the bark-stove, in a moist heat. Native of Peru. Flowering in August and September. Introduced 1813.

CULTURE.—The species of this genus are readily increased by cuttings, which root freely in a moist heat. A mixture

of loam and peat is the best soil to grow them in.

BRUNFELSIA

Class Didynamia Angiospermia. Nat. Ord. *Solanææ*.

The Characters are—*Calyx five-toothed, small; tube of corolla very long, with a flat five-lobed limb; capsule berryed, one-celled, many-seeded, with a very large receptacle.*

1. *BRUNFELSIA UNDULATA* (large-flowered *Brunfelsia*). Bot. Reg. t. 228. *Leaves ovate-lanceolate, narrowed at each end; tube of corolla curved; limb wavy.*—This is a tree growing from ten to fifteen feet in height. The stem is feeble. Flowers axillary, terminating, handsome, and very sweet-scented. Corolla yellow, turning white, and having a tube four or six inches in length. Native of Jamaica, where they call it Trumpet-flower. Flowers in June and July. Introduced 1789.

2. *BRUNFELSIA AMERICANA* (American *Brunfelsia*). Bot. Mag. t. 393. *Leaves obovate, acuminate, longer than the petiole; tube of corolla straight; limb entire.*—A tree ten feet high; its blossoms are large and showy, of a pale colour, inclining to sulphur colour; these are produced during most of the summer months, and frequently in pairs. Native of the West Indies. Introduced 1735.

3. *BRUNFELSIA VIOLACEA* (purple stalked *Brunfelsia*). Bot. Cab. 792. *Leaves and leafstalks deeply stained with purple.*—It is a shrub of moderate growth. Flowering in July. Native of the West Indies. Introduced 1815.

CULTURE.—The species of this genus require to be kept at all times in the stove. They should be potted in rich loam and peat; and may be increased by layers or cuttings, which root freely in sand under a hand-glass.

BRUNIA (in honour of Le Brun a Dutch traveller in Asia-minor &c.)

Class Pentandria Monogynia. Nat. Ord. *Bruniaceæ*.

The Characters are—*Calyx adhering to the half inferior ovary; ovary two-celled; cells 1-2-seeded; styles two.*

1. *BRUNIA NODIFLORA* (knot-flowered *Brunia*). *Leaves lanceolate, oval-shaped, acute, smooth, trigonal.*—A shrub two feet high, with heads of white globose flowers about the size of a cherry. Native of the Cape of Good Hope. Flow-

ering in July and August. Introduced 1786.

2. *BRUNIA RACEMOSA* (Racemose-flowered Brunia). *Leaves spreading, sessile, ovate, acuminate, somewhat cordate, three-nerved.*—A shrub five feet high. Flowers white, panicle; panicle composed of dense, distant, rather leafy racemes. They are produced from May to September. Introduced 1790.

CULTURE.—The species of this genus are numerous. They are all natives of the Cape of Good Hope, and elegant looking shrubs resembling the heaths in appearance, but with very insignificant flowers. They may be increased by cuttings which strike root freely in sand, with a bell-glass over them.

BRUNSVIGIA.

Class Hexandria Monogynia. Nat. Ord. *Amarylloideæ*.

The Characters are—*Corolla superior, in six deep segments; capsule turbinate membranous, with three wings; seeds several, pointed.*

1. *BRUNSVIGIA LATICOMA* (broad-headed Brunsvigia). Bot. Reg. t. 497. *Leaves linear lorate.*—The bulb is ovately oblong. Leaves one and a half feet long and about two-thirds of an inch broad, shining green on both sides; umbel 17-flowered. Flower nodding, whitish-pink. Germen reddish-green, cells closely filled by about five globular ovula in two rows. Native of the Cape; flowering in August. Introduced 1819.

2. *BRUNSVIGIA MINOR* (lesser Brunsvigia). Bot. Reg. t. 954. *Leaves 3-4 oblong.*—The flower stem rises long before the leaves. The spathe is fleshy, peculiarly thick. Leaves six inches long, one broad, in their growth and shape, resembling very much the *multiflora*. The flowers are very ornamental, of a scarlet colour. They appear from June to August. Introduced 1816.

3. *BRUNSVIGIA JOSEPHINÆ* (Josephine Brunsvigia). Redout. t. 370, 372. *Leaves strap shaped, erect, spreading glaucous; scape twice as long as the rays of the many flowered umbel.*—This most beautiful plant was named by M. Redoute in compliment to the Empress Josephine in whose magnificent garden it flowered for the first time in Europe. The flowers of a scarlet colour, grow in

an hemispherical umbel to the number of about sixty. Pedicels of a violet blue. Native of the Cape. Flowering from June to August. Introduced 1814.

4. *BRUNSVIGIA MULTIFLORA* (many flowered Brunsvigia). Bot. Mag. t. 1619. *Leaves uniform, lying on the ground, smooth.*—The large scaly bulb, bears five or six obovate oblong, dark-green leaves, usually a foot long, and near three inches broad. Flower stalk earlier than the leaves, erect, a foot high, crowned with a broad sheath, of two-coloured valves, unequal in breadth; umbel of about thirty six rays, spreading in all directions, each six inches long, bearing a solitary erect flower. All the stalks are more or less blood red. Corolla richly buried with crimson and a kind of orange-scarlet. Capsule four inches long and one broad, pale-brown, shining, tapering very much at the base.

The bulb is not very uncommon in our gardens but it rarely flowers. The bloom has no scent. Native of the Cape of Good Hope. Flowering in September. Introduced 1752.

CULTURE.—The species of this genus are splendid plants. Some of the bulbs grow to a great size, requiring large pots to have them thrive and flower in perfection. All these bulbous rooted flowers delight in a loose sandy earth, mixed with good kitchen mould. They require plenty of water when in a growing state; but must when dormant be kept so by wholly withholding water. They are increased readily by offsets from the bulbs, or by seeds.

BRYA (from *bryo* to sprout; the seeds germinate before falling from the tree).

Class Monadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx five-toothed, stamens monadelphous; legume two-jointed; joints one-seeded.*

BRYA EBENUS (Jamaica ebony Brya). Br. Jam. t. 31. f. 2. *Leaflets aggregate, obovate.*—This tree has a pretty thick stem which rises twelve or fourteen feet high, covered with a rugged bark, and divides into many spreading branches, which grow almost horizontal and are armed with short brown crooked spines. The flowers appear in July and August, and come out upon slender footstalks from the side of the branches singly; they are of a bright yellow

colour, and are succeeded by compressed moon-shaped pods, which inclose one kidney-shaped seed. It is very common in the West Indies, and the wood is sent to Europe under the name of American Ebony.

Though not the true ebony, yet being of a greenish-brown colour, and polishing well, it is much coveted by the instrument makers, and is of a very hard durable nature.

Dr. Browne says that the small dimensions of this shrubby tree renders it fit only for few purposes, the trunk seldom exceeding three or four inches in diameter, but that the slender branches being very tough and flexible, are frequently used for riding switches, and generally kept at all the wharfs about Kingston, to scourge the refractory slaves. Introduced 1718.

CULTURE.—The species of this genus thrive best in loamy soil, and may be increased by young cuttings with their leaves on, planted in sand under a hand-glass in heat.

BRYONIA.

Class Monœcia Monadelphia. Nat. Ord. *Cucurbitaceæ*.

The Characters are—**BARREN FLOWERS**—*calyx five-dentate; corolla five-cleft; filaments three; anthers five; FERTILE FLOWERS*—*calyx five-dentate; corolla five-cleft; style trifid; berry inferior, globose, many seeded.*

1. **BRYONIA DIOICA** (red fruited Bryony). Eng. Bot. t. 439. *Leaves cordate, palmate, five-lobed, with callous dots; flowers racemose, diœcious.*—It is a native of dry banks under hedges, in many parts of Britain, and is easily distinguished by its prodigious root, its stem climbing by tendrils, leaves resembling those of the vine in shape—not smooth however as they are, but harsh and rugged, and of a paler colour—and by its bunches of small berries, which are red when ripe, and produced on a different plant from male flowers.

Mr. Miller has observed, that several plants (with red berries) which he cultivated in different parts of the garden, were of different sexes while young; but that the plants which produced only male flowers the two first years, afterwards had flowers of both sexes; the number of female flowers the first year was small, but as the plants grew older, they became more fruitful. The case is the same in the

Mulberry and other trees which produce flowers of both sexes.

Black-berried white Bryony seems to differ from the red in little else besides the colour of the berries. Goats alone are said to eat this plant. The flowers appear in May. Our old herbalist Gerard says, “The Queen’s chief Chirurgeon, Master William Goodoron, shewed me a roote heereof, that waied halfe an hundred waighte, and of the bignes of a childe of a yeere olde.”

The roots of this plant have by impostors been wrought into a human shape, and shewn for mandrakes. Their method was to find a young thriving plant of bryony; then they opened the earth all round, being careful not to disturb the lower fibres; and being provided with such a mould as is used for making plaister figures, they fixed the mould close to the root, fastening it with wire to keep it in its proper situation; then they filled the earth about the root, leaving it to grow to the shape of the mould, which in one summer it will do; so that if done in March, by September it will have the shape. The leaves of the plant are also imposed on the people for mandrake leaves, although there is no resemblance between them, nor any agreement in quality. The roots of this species are used in medicine. These are very large, sometimes as thick as a man’s thigh; their smell, when fresh, is strong and disagreeable; the taste nauseously bitter, acrid, and biting; the juice is so sharp, as in a little time to excoriate the skin: in drying, they lose a great part of their acrimony, and almost their whole scent. Bryony root is a strong irritating cathartic, and, applied externally, is said to be a powerful discutient.

2. **BRYONIA QUINQUELOBA** (five-lobed Cape Bryony). *Leaves five-lobed, toothletted, scabrous above; peduncles one-flowered.*—A native of the Cape of Good Hope. The root is large and fleshy. Stems herbaceous, climbing by spiral filiform tendrils. Flowers of a pinkish buff-colour. It is not known at what period it was introduced into our collections.

3. **BRYONIA GRANDIS** (great flowered Bryony). *Leaves cordate, angular, entire, smooth with callous dots above and five glands at the base beneath.*—The stem is shrubby, branching, scant.

Flowers large, whitish, androgynous; peduncles one-flowered; berry roundish, red. Native of India and Cochin China. Flowering from May to August. Introduced 1793.

CULTURE.—The species of this genus are very numerous. *Common European Bryony* may be cultivated in a garden for use, by sowing the berries in the spring, on a dry poor soil. In two years' time the roots will grow to a large size, if the plants be not too close. But it is common enough on dry banks and in hedges, in many parts of England. The other species being natives of the East and West Indies, the Canary Islands, or the Cape of Good Hope, require the protection of the bark or dry stove, according to the climate they come from.

These are also propagated by seeds, sown on a hot-bed. When they are fit to transplant, they should be put into pots, filled with light fresh earth. When they have taken good root, they should have as much air as possible, and may frequently be refreshed with water in dry weather. Several of them will endure the open air in the summer season; but in winter they must all be sheltered, and then they should have very little water. They mostly flower in July, and in favourable summers will perfect their seeds.

BRYOPHYLLUM.

Class Octandria Tetragynia. Nat. Ord. *Crassulaceæ*.

The Characters are—*Sepals 4; petals 4; connate into a cylinder, seeds many.*

BRYOPHYLLUM CALYCLINUM (large cupped Bryophyllum). Bot. Mag. t. 1409. *Leaves oval, crenate; flowers long, pendulous, cylindrical.*—This singular plant is a native of Bengal. It flowers in May. The flowers, of a greenish-purple colour, are produced in terminal compound panicles. This plant possesses the singular property of germinating from the dark spot observable at the base of every indentation in the margin of the leaf, not whilst growing, but as it decays. Introduced 1800.

CULTURE.—This plant requires very little water, and the pot to be well drained; it should be kept in a moderate stove. It flowers best plunged into a tan heat. Propagated by the crenatures of the leaves or by cuttings. A rich loamy soil suits it best.

BUBON (from *boubon*, the groin, or a tumour in that part, which this plant was supposed to cure).

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Involucres 0; fruit ovate, solid, hispid or villous with five ribs, and broadish bands of the interval and raphe.*

BUBON GALBANUM (Lovage-leaved Bubon). Jacq. V. t. 130. *Leaflets ovate, wedge shaped, acute, finely serrate; umbels few; seeds smooth; stems glaucous.*—It rises with an upright stalk to the height of eight or ten feet, which at bottom is woody, having a purplish bark covered with a whitish powder that comes off when handled. The top of the stalk is terminated by an umbel of yellow flowers, which are succeeded by oblong channelled seeds, which have a thin membrane or wing on their border. When any part of the plant is broken, there issues out a little thin milk of a cream colour, which has a strong scent of galbanum, and soon becomes sufficiently concreted for gathering. This gum-resin, medicinally considered, may be said to hold a middle place between *Asafoetida* and *Ammoniacum*; but it is far less fetid than the former. It has the credit of being highly useful in hysterical cases, and of promoting and correcting various secretions and uterine evacuations. Externally it has been applied to expedite the suppuration of indolent tumours, and especially as a warm, stimulating plaster. Native of the Cape of Good Hope. Cultivated by Gerard in 1596.

CULTURE.—The seeds should be sown in pots filled with light loamy earth, as soon as they arrive. If it be in autumn, they should be kept during the winter, in a bed of tanners' bark, where the heat is gone. In spring the plants will come up, and in April, should be carefully transplanted into fresh pots filled with the same kind of earth. After having remained in the bark till they have taken root, they should be gradually inured to the open air, and may be placed in June with other exotic plants in a sheltered situation. In winter, they must be kept in a green-house, where they should have but little water.

BUCHANANIA (in honour of J. Hamilton, M.D. (formerly Buchanan), of Ilay

in Scotland. A great traveller in the East.

Class Decandria Monogynia. Nat. Ord. *Cassuriceæ*.

The Characters are—*Flowers hermaphrodite; calyx five-cleft; petals five inserted under the disk; stamens 10; disk ten-crenate; ovaries 5, four barren, drupes rather fleshy, one-celled.*

BUCHANANIA ANGUSTIFOLIA (narrow leaved Buchananiana). Rox. Cor. t. 262. *Leaves oval-oblong, blunt at the apex.*—A small growing tree, native of the southern part of India. Branches numerous, spreading, and abounding in branchlets and foliage. The leaves are of a firm texture, smooth on both sides, from three to six inches long, and from one to two and a half broad. Flowers numerous, small, white. Drupes nearly round, of the size of a gooseberry; when ripe, yellow and succulent. Introduced 1820.

CULTURE.—The species of this genus require a light loamy soil. They may be increased by ripened cuttings, which strike root freely in sand under a hand-glass in heat.

BUCHNERA.

Class Didynamia Angiospermia. Nat. Ord. *Scrophularinæ*.

The Characters are—*Calyx absolutely five-toothed; limb of corolla five-fid, equal, with cordate lobes; capsule two-celled.*

BUCHNERA AMERICANA (American Buchnera). *Leaves toothed, lanceolate, three-nerved.*—In this species the stem is scarcely branching. Flowers in a spike remote from each other. They are of a blue colour. Two of the stamens in the jaws of the corolla, and two in the middle of the tube. The herb grows black in drying. It is a native of Virginia and Canada; Flowering in July and August. Introduced 1733.

CULTURE.—The species of this genus are principally from the Cape of Good Hope. They are shrubs of little interest or beauty. Their leaves are generally small and their flowers white. They may be increased by dividing the roots. They require a sandy soil.

BUCIDA.

Class Decandria Monogynia. Nat. Ord. *Combretaceæ*.

The Characters are—*Calyx five-toothed, superior; berry one seeded.*

BUCIDA BUCERAS (Jamaica Olive-

bark-Tree). Bot. Reg. t. 907. *Leaves wedge-shaped, smooth.*—Browne observes that this tree is remarkable for its slender crooked branches, and the tufted disposition of the leaves: that it grows to a considerable size, is reckoned an excellent timber tree, and that the bark is greatly esteemed by the tanners. The flowers are small, yellowish. Its wood is excellent for chests of drawers and other kinds of cabinet makers' work as it is seldom attacked by worms.

It is a native of the West Indies, in low swampy lands near the coast. Flowering in spring.

CULTURE.—These plants may be increased readily by well ripened cuttings, which root freely in sand under a hand glass in heat.

BUDDLEA (named by Dr. Houstoun from A. Buddle, who is often mentioned in Ray's Synopsis. His dried collection of British plants is preserved in the British Museum).

Class Petandria Monogynia. Nat. Ord. *Scrophularinæ*.

The Characters are—*Calyx and corolla four cleft, stamens from the incisures; capsule two-furrowed, two-celled, many seeded.*

1. BUDDLEA MADAGASCARIENSIS (Madagascar Buddle). Bot. Mag. t. 2824. *Leaves ovate lanceolate, petiolate.*—A twiggy and straggling shrub, with dark-green leaves on the upper surface, clothed with a dense tomentum inclining to rusty below. The flowers, which are numerous, are of a bright orange-colour. They are placed in a compound erect raceme, each pedicel bearing three, sometimes five flowers, which yield a powerful honey-like smell. Native of Madagascar. Flowering in September. Introduced 1826.

2. BUDDLEA BRASILIENSIS (Brazilian Buddle). Bot. Mag. t. 2173. *Leaves opposite, decussate, broadly decurrent along the petiole, unequally dentate, crenated.*—An erect shrub, with orange-yellow flowers. They grow in whorls, and are hairy both within and without. The leaves are green, and reticulated above; soft, tomentose beneath. Native of Brazil. Flowering in our stoves in November. Introduced 1826.

3. BUDDLEA GLOBOSA (round headed Buddle). Bot. Mag. t. 174. *Leaves lanceolate, acuminate, crenulate, beneath hairy; heads globose, stalked.*—It

destroy it. It is a beautiful shrub. The flowers are of an orange colour, in close peduncled heads, two together on opposite sides of the branches. It flowers in May and June. Introduced 1776.

4. *BUDDLEA CONNATA* (connate-leaved Buddlea). Bot. Mag. t. 2353. *Leaves lanceolate, serrated, connate at base.*—It forms a handsome green-house shrub, remarkable for its curiously connate foliage. The flowers, of a deep orange-colour, grow in a globose head; they are produced in the beginning of May, and possess a fragrance resembling that of honey. Native of Peru. Intro. 1827.

5. *BUDDLEA AMERICANA* (American Buddlea). Sloane Hist. t. 173. f. 1. *Leaves opposite, acute, narrowing at base into the petiole.*—It rises to the height of ten or twelve feet, with a thick woody stem covered with grey bark, and sends out many branches towards the top, which come out opposite: at the ends of the branches the flowers are produced in long close spikes branching out in clusters, which are yellow, consisting of one leaf cut into four segments: these are succeeded by oblong capsules filled with small seeds. Native of the West Indies. Introduced 1730.

CULTURE.—The numerous species of this genus are beautiful plants that thrive well in any loamy soil. They may be increased readily by cuttings, which root freely under a hand-glass.

BUFFONIA (named after the celebrated Count de Buffon).

Class Tetrandria Digynia. Nat. Ord. *Caryophyllææ*.

The Characters are—*Calyx four-leaved; petals 4; one shorter than calyx; capsule one-celled; two-valved, two-seeded.*

BUFFONIA ANNUA (annual Buffonia). Eng. Bot. t. 830. *Stem branched at end; branches erect; calyx scarious at end.*—An annual, flowering in June; stem erect, branched leaves opposite, awl-shaped, dilated at base. Flowers on roughish, stalks, upright, small, white. Capsule of two flattish valves, containing two large rough seeds. This species is very rare in this country. It is said to have been found on the sea coast, about Boston in Lincolnshire.

Class Hexandria Monogynia. Nat. Ord. *Asphodelææ*.

The Characters are—*Sepals 6; spreading; filaments smooth; capsule ovate; seeds angular.*

1. *BULBINE CANALICULATA* (channel leaved Bulbine). Bot. Mag. t. 1124. *Leaves fleshy, gladiate-triquetrous, channelled on the narrow side.*—A native of the Cape of Good Hope. Raceme many flowered. Flowers white, dirty green on the outside. It blooms in April. Introduced 1774.

2. *BULBINE SEMI-BARBATA* (half-bearded Bulbine). Bot. Cab. 330. *Leaves semi-terete canaliculate.*—A native of new South Wales. The scape varies from six inches to two feet in height. The blossoms, of a yellow colour, come out one or two only at a time, and as these go off, others open at the stem. The seed is often ripe on the lower part of the spike, while the upper continues flowering. Introduced 1818.

3. *BULBINE ANNUA* (annual Bulbine). Bot. Mag. t. 1451. *Leaves fleshy-subulate, rounded; scape racemose.*—An annual fibrous-rooted plant, growing close to the ground, with leaves eight inches high, and filled with watery pulp. The flowers are yellow, marked externally with a green line, and are succeeded by round seed vessels. It blooms in August. Introduced 1748.

4. *BULBINE LONGISCAPA* (glaucous-leaved Bulbine). Bot. Mag. t. 1339. *Leaves fleshy, subulate, half-rounded; flexuose, glaucous five times as short as scape.*—The leaves are extremely glaucous. Flower stem three feet high. The flowers are yellow, and grow on loose spikes; these appear at different periods, and are succeeded by seeds in great abundance. A native of the Cape. Introduced 1748.

5. *BULBINE FRUTESCENS* (shrubby Bulbine). Bot. Mag. t. 816. *Leaves fleshy, rounded; stem shrubby, erect, branched.*—This species, formerly known in our gardens by the name of the onion leaved Aloe, is very common in our green-houses; its caudex throws out the longest scape of any of the genus, and is generally covered with dried leaves: where these fall off, it has a seamed and jointed appearance. The

fruitless pedicels are very much incurved. Introduced 1702.

6. **BULBINE ALOIDES** (aloe-leaved Bulbine). Bot. Mag. t. 1417. *Leaves fleshy, tongue-shaped, lanceolate, flat on both sides.*—It has broad pulpy leaves, resembling those of some sorts of aloe, and was therefore formerly called *Aloe with flowers of spiderwort*. The leaves spread open. The flowers are produced on loose spikes; they are yellow, and appear at different seasons. Native of the Cape. Introduced 1759.

CULTURE.—The species of this genus are numerous, and are deservedly common in flower gardens, being at once showy, fragrant, of easy culture, and rapid increase by suckers, which root freely in a light sandy loam; and most of the kinds will produce perfect seed.

BULBOCODIUM.

Class Hexandria Monogynia. Nat. Ord. *Melanthaceæ*.

The Characters are—*Sepals 6; funnel-shaped, with narrow claws, bearing the stamens.*

1. **BULBOCODIUM VERNUM** (spring flowering Bulbocodium). Bot. Mag. t. 153. *Leaves lanceolate.*—It is a mountainous plant, a native of Spain, and flowers in the open ground at the same time as the crocus, for a purple variety of which it might easily be mistaken at first sight; but it differs from the crocus in having six stamina, and from the colchium, to which it is very nearly allied, in having one style instead of three. It varies in the colour of its flowers; the bulb is enveloped in a rough and velvety covering. Introduced 1620.

This plant is propagated by offsets, in the same manner as other bulbous rooted flowers. The time to remove them is soon after their leaves decay, but the roots may be kept out of the ground without prejudice at that season. They should not be moved oftener than every third year, for the roots do not multiply very fast; by suffering them therefore to remain, they will flower much stronger, and make a greater increase than if they are often taken up.

It should have a warm situation, and may be planted in a south border, in a fresh loamy soil, but not dunged. It may also be propagated by seeds.

BULLIARDA (named after Bulliard, a French botanist).

Class Tetrandria Tetragynia. Nat. Ord. *Crassulaceæ*.

The Characters are—*Divisions of calyx, petals, and stamens, 4; nectariferous scales 4; linear; carpels 4; many seeded.*

BULLIARDA VAILLANTII (Vaillant's Bulliarda). D. C. pl. grass. t. 79. *Leaves oblong, acute.*—A small, glabrous, annual, subaquatic herb, with small, axillary, white, sessile flowers. They are produced from June to August. Native of France, in humid shady places. Introduced 1825.

CULTURE.—The species of this genus are increased by seed, which require to be sown in a gravelly soil, and kept moist.

BUMELIA.

Class Pentandria Monogynia. Nat. Ord. *Sapotææ*.

The characters are—*Calyx five parted, very small; corolla campanulate, five-cleft; nectary a five leaved crown, adhering to the tube of the corolla; drupe ovate, globose.*

BUMELIA LYCIOIDES (Box-thorn leaved Bumelia). Duh. Ab. t. 68. *Prickly; leaves lanceolate, obtuse, acute at base, attenuate, smooth.*—An ornamental deciduous shrub, native of North America. It grows to the height of ten feet; the flowers are white, and appear in August. Increased by layers, in a mixture of sandy loam. Introduced 1768.

CULTURE.—Some of the species of this genus are robust enough to bear our winters in the open air; but they are rather tender, and require to be covered with mats during the winter. Cuttings root in sand under a hand-glass.

BUNCHOSIA.

Class Decandria Monogynia. Nat. Ord. *Malpighiaceæ*.

The Characters are—*Calyx furnished with eight-ten large glands on the outside of the base; styles one, simple, bifid, or trifid at the apex; drupe 2-3; one-seeded cells.*

BUNCHOSIA GLANDULIFERA (gland-bearing Bunchosia). Jacq. le Rar. t. 49. *Leaves elliptical ovate, on short petioles; wavy, pubescent on both surfaces.*—A small shrub ten feet high, with yellow flowers, which are produced in simple racemes from March to May. Fruit red; they are much eaten by Turks and other large fowls. Native of Guadaloupe in woods. Introduced 1806.

CULTURE.—The species of this genus

are numerous, and are rather ornamental. They are increased by ripened cuttings, which root freely in sand under a hand-glass in heat.

BUNIAS.

Class Tetradynamia Siliculosa. Nat. Ord. *Cruciferae*.

The Characters are—*Silicle nucamentaceous, indehiscent, two four-celled; cotelydons twisted spirally.*

1. BUNIAS ERUCAGO (rocket Bunias). Jacq. Aust. t. 340. *Pods four-sided, angles crested; radical leaves runcinate.* This is an annual plant, sending out many branches, which spread, and incline towards the ground. The leaves are glaucous, and deeply divided into many segments, almost like those of *Swine's Cress*. The flowers are produced singly from the axis of the leaves, towards the extremity of the branches; they are small, and of a pale yellowish colour. It is abundant in corn-fields, in the southern parts of France; Flowering from April to June. Introduced 1640.

2. BUNIAS ORIENTALIS (Oriental Bunias). *Pods ovate, two-celled, not crested, but somewhat warted.*—It grows naturally in the Levant and throughout European Russia, and in Siberia. The root is perennial, with an annual stalk. Stalks two feet high. Branches terminated by loose spikes of yellow flowers. These are produced from May to July. Introduced 1730.

CULTURE.—These plants are readily increased by seed, sown in any common soil.

BUNIUM.

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Fruit slightly ribbed; calyx small, acute, unequal; petals inversely heart-shaped; flowers imperfectly separated.*

BUNIUM BULBOCASTANUM (great Earth-nut). Eng. Bot. 988. *Leaves uniform; involucre many-leaved.*—It grows naturally in moist pastures in Britain, and has a tuberous solid root, which lies deep in the ground. The leaves are finely cut, and lie near the ground. The stalk rises a foot and a half high, is round, channelled, and solid. The flowers are white, and shaped like those of other umbelliferous plants; the seeds are small, oblong, and when ripe are channelled. The roots of this sort are frequently dug up,

and by some people eaten raw. They have much resemblance in taste to a chesnut, to which they are superior when roasted; whence the specific name.

CULTURE.—The species of this genus are only to be increased by seed, which requires to be sown in a light sandy soil.

BUNAPARTEA (named in honour of the celebrated Napoleon Buonaparte).

Class Hexandria Monogynia. Nat. Ord. *Bromeliaceae*.

The Characters are—*Calyx two-leaved; petals 3, convolute; stamens inserted in the receptacle; anthers exserted; style three-cornered; capsules three-celled, three-valved; seeds terminated by a bristle.*

BUNAPARTEA JUNCÆA (rush-leaved Buonaparte). Fl. Per. t. 242. *Leaves multifarious, caespitose, very narrow, rigid.*—An ornamental plant resembling *Bromelia*, with long, narrow, recurved leaves, and spikes of simple blue flowers. A native of Peru. Introduced 1800.

CULTURE.—The species of this genus are fine stove plants, that thrive best in a mixture of loam and decayed leaves, and are increased by cuttings.

BUPHTHALMUM.

Class Syngenesia Polygamia Superflua. Nat. Ord. *Compositae*.

The Characters are—*Receptacle paleaceous; pappus an obsolete rim; sides of pericarps, especially of the ray, edged.*

BUPHTHALMUM SERICEUM (silky Ox-eye). Bot. Mag. t. 1836. *Leaves opposite, close, spatulate, oblong, silky; scales of involucrem setaceous, hirsute.*—A handsome dwarf shrub. Branches thick, woody. Flowers terminal, large, yellow. They are produced most part of summer. Native of the Canary Islands. Introduced 1779.

CULTURE.—There are many species of this genus, all of which may be propagated by seeds; and those which do not, by parting their roots, or cuttings of their branches. Some of the species are tender, and require to be raised on a hot-bed.

BUPLEURUM.

Class Pentandria Digynia. Nat. Ord. *Umbelliferae*.

The Characters are—*Flowers hermaphrodite; fruit prismatic, ovate, ribbed; leaves simple.*

1. *BUPLEURUM FRUTICOSUM* (shrubby Hare's-ear). Fl. Græc. t. 263. *Leaves lanceolate, obovate, entire, sessile.*—It rises with a shrubby stem, dividing into numerous branches, forming a bushy head five or six feet high, adorned with leaves of a sea-green colour, placed alternate, with yellow flowers in umbels at the ends of the branches, which appear in July and August, and are sometimes succeeded by ripe seeds. It may be propagated by cuttings, planted in fresh loamy earth.

2. *BUPLEURUM TENUISSIMUM* (slender thorough wax, or Hare's-ear). Eng. Bot. t. 478. *Umbels simple, alternate, of about three flowers, with an involucre of five awl-shaped leaves.*—The whole plant has a pungent disagreeable taste and smell, and is of an acrid quality. The flowers are small, and of a greenish yellow colour. It prefers a muddy soil, overflowed by salt water. Flowering in August.

3. *BUPLEURUM ROTUNDIFOLIUM* (rough leaved Hare's-ear). Eng. Bot. 99. *No general involucre; leaves perfoliate.*—A somewhat unfrequent annual in corn-fields, generally preferring a dry and chalky soil. Every part of the herb is remarkably hard and rigid, with a slight aromatic smell. The flowers are small and yellowish, coming out in June and July.

CULTURE.—This is a numerous genus; most of the species are shrubby plants, in general only cultivated in botanic gardens. The greenhouse sorts flourish in a mixture of peat and loam, and are increased readily by cuttings. The annuals are increased freely by seeds sown in the open ground, and kept clear from weeds.

BURCHELLIA (named after W. Burchell, a traveller in Africa).

Class Pentandria Monogynia. Nat. Ord. *Rubiaceæ*.

The Characters are—*Heads of flowers in an involucre; corolla clavate, funnel-shaped, with a five-cleft short limb, and a beardless orifice; segments before expansion twisted together; stamens inserted; anthers subsessile, included; stigma clavate; berry crowned by the deeply five-cleft calyx, two-celled, many seeded.*

BURCHELLIA CAPENSIS (broad-leaved Burchellia). Bot. Reg. t. 466. *Leaves ovate, acute, clothed with hispid pubescence.*—A beautiful dwarf hardy stove

shrub, with tubular scarlet flowers in terminal clusters. It is called at the Cape of Good Hope, of which it is a native, *Buffel Horn*, from the hardness of the wood. The flowers appear in May and June. Introduced 1818.

CULTURE.—The species of this genus deserve a place in every collection, thriving well in a rich light soil, and are increased readily by cuttings, planted in sand with a hand-glass over them.

BURSARIA (from *bursa* a pouch, in allusion to the form of the capsules).

Class Pentandria Monogynia. Nat. Ord. *Pittosporææ*.

The Characters are—*Calyx inferior, five-toothed; petals 5, linear; stigma simple; capsule cordate, compressed, two-partible, two-seeded; seeds reniform.*

BURSARIA SPINOSA (thorny Bursaria). *Stems spiny; leaves emarginate; flowers racemose.*—A pretty flowering hardy greenhouse shrub, very showy when covered all over with its numerous, aggregate, terminal clusters of elegant little white blossoms. Native of New South Wales. Flowering from August to December. Introduced 1793. It thrives in a sandy peat soil, and is increased readily by cuttings, in sand with a hand-glass over them.

BURSERA (after J. Burser, a pupil of C. Bauhin).

Class Polyandria Diœcia. Nat. Ord. *Burseriaceæ*.

The Characters are—*HERMAPHRODITE—calyx five-toothed; petals 5; stamens 10; styles 3; capsules three-valved, one-seeded, MALE—calyx five-toothed; petals 5; stamens 10.*

1. *BURSERIA SERRATA* (serrated leaved Bursera). Lin. Trans. v. 15. t. 4. f. 1. *Leaves impari, pinnate, with three-five pairs of broad-lanceolate serrated leaflets.*—A tree seventy feet high. The timber is much esteemed, being close grained and as hard as oak. Native of the forests bordering on Bengal. Introduced 1818.

2. *BURSERIA GUMMIFERA* (Jamaica Bursera). Jac. Amer. t. 65. *Leaves pinnate, with an odd one; leaflets ovate, acute.*—This very lofty tree is common in all the sugar islands of the West Indies. The bark is very thick, and exudes a clear transparent resin, which soon hardens in the air, and looks like the mastic of the shops; but by

incision it yields a considerable quantity of a more fluid substance, which has much of the smell and appearance of turpentine, and may be used for the same purposes. The bark of the root is thought to be the *Sima-rouba* of the shops, which is an effectual remedy in bloody fluxes: it is administered in decoctions; and one or two drachms is sufficient for a quart of water; for if it be strong, it purges or vomits.

In the French islands it is called *Gommier Blanc*, and an infusion of the buds and young leaves is recommended there in disorders of the breast. It flowers from May to July. The flowers are small and white, produced in axillary terminating racemes. Introduced 1690.

CULTURE.—The species of this genus require to be kept in the stove, where they thrive well in a mixture of loam, peat, and sand. They are increased by cuttings, planted in sand under a bell-glass in heat.

BURTONIA.

Class Decandria Monogynia. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx deeply five-cleft; corolla deciduous; petals nearly equal; ovary two-seeded; style subulate, dilated at base; stigma blunt, beardless; pod roundish, moderately inflated; no appendage to the seed.*

BURTONIA SCABRA (rough leaved Burtonia). *Leaves ternate; calyx smooth; style bearded beyond the middle.*—A greenhouse shrub. Flowering from May to July. The leaves are sessile, and rough to the touch. Flowers axillary at the ends of the branches, of a light purple colour.

CULTURE.—Mr. Sweet observes, that this plant "requires more than ordinary treatment to keep it in good health; an equal mixture of very sandy loam and peat is the best soil for it, and the pots to be well drained. Young cuttings root in sand under a bell-glass."

BUTEA (in honour of John Earl of Bute, once a munificent patron of botany).

Class Diadelphia Decandria. Nat. Ord. *Leguminosæ*.

The Characters are—*Calyx subbilabiate; vexillum very long, lanceolate; legume compressed, membranous, one-seeded.*

I. BUTEA FRONDOSA (downy branched Butea). Rox. Cor. t. 21. *Leaflets*

roundish, emarginate.—A tree forty feet high, from which, when cut, exudes a gummy blood-red juice of a sweetish taste. It is the *gum lac* of commerce. Infusion of the flowers dye cotton cloth, previously impregnated with a solution of alum, of a beautiful yellow colour. The flowers are produced in racemes; they are of a deep scarlet colour. Native of the East Indies. Introduced 1796.

2. BUTEA SUPERBA (smooth branched Butea). Rox. t. 22. *Leaflets obovate, roundish, blunt.*—It is a shewy tree, differing but little from the preceding. Native of Malabar. Introduced 1798.

CULTURE.—The species of this genus are stove plants; which thrive well in loam and peat. Young cuttings root readily in sand in a moist heat.

BUTOMUS.

Class Euneandria Trigynia. Nat. Ord. *Butomeæ*.

The Characters are—*Sepals 6; capsules 6, many-seeded.*

BUTOMUS UMBELLATUS (umbelled flowering Rush). Eng. Bot. t. 651. *Flowers in handsome terminal umbels; leaves ensiform.*—It is the only plant of the class *Euneandria* which grows wild in Britain.

"The Water-gladiole or grassie Rush," says Gerard, "is of all others the fairest and most pleasant to behold, and serveth very well for the decking and trimming up of houses, because of the beautie and braverie thereof."

There are two varieties, the one with a white, the other with a rose-coloured flower. Though common plants, they are very pretty, and are worth propagating in a garden where there is convenience for an artificial bog, or where there are ponds of standing water, as is many times the case. Where these conveniences are wanting, they may be planted in cisterns, which should be kept filled with water, with about a foot thickness of earth in the bottom; and into this earth the roots should be planted, or the seeds sown as soon as they are ripe.

BUTTER, a fat unctuous substance, prepared from milk by the process of churning. It was late before the Greeks appear to have had any notion of butter; their poets make no mention of it, and yet frequently speak of milk and cheese. The Romans used butter no otherwise than as a medicine, never as

a food. The ancient Christians of Egypt burnt butter in their lamps instead of oil; and in the Roman churches, it was anciently allowed, during Christmas time, to burn butter instead of oil, on account of the great consumption of it otherwise.

BUXUS.

Class Monœcia Tetrandria. Nat. Ord. *Euphorbiaceæ*.

The Characters are—**MALE**—*calyx three-leaved; petals 2; rudiment of an ovary.* **FEMALE**—*calyx four-leaved; petals 3; styles 3; Capsule with three beaks and three cells; seeds 2.*

BUXUS SEMPERVIRENS (common Box Tree) Eng. Bot. 1341. *Leaves ovate; petioles hairy at edge; anthers ovate, sagittate.*—The box is a native of most parts of Europe, from Britain southwards, and is very abundant in different parts of France and Switzerland. It abounds in many countries of Asia, as about Mount Caucasus, in Persia, China, Cochin China, and America. It was formerly very common in England, but has gradually disappeared as agriculture extended. Box-Hill in Surrey, Boxley in Kent, and Boxwell in Gloucestershire, are named from their abounding in this tree. The timber of the box tree is of considerable value. It is sold by weight, and being very hard and smooth, and not apt to warp, is very well adapted to a variety of nicer works. It is as extensively employed now as it appears to have been in the days of Evelyn, "for the turner, engraver, carver, mathematical instrument maker, comb and pipe-flute maker: and the roots for the inlayer and cabinet maker. Of box are made wheels and shivers, pins, pegs for musical instruments, nut-crackers, button-moulds, weavers' shuttles, hollar-sticks, bump-sticks, and dressers for the shoemaker, rulers, rolling-pins, pestles, mallets, beetles, tops, tables, chessmen, screws, bobbins for bone-lace, spoons, knife-handles, but especially combs."

The English wood is esteemed inferior to that which comes from the Levant, and the American box is said to be preferable to ours, for most purposes; but the English is superior for the purpose of the engraver.

The ancients made combs of box, and musical instruments to be played upon by the mouth. The Romans like-

wise clipped it into form, for which nothing, says Pliny, is more fit. And Martial mentions clipped box trees in the gardens at Bassus's country-house.

The tree box was second to the yew with us in former times for the purpose of being clipped into the shape of animals, &c.; but the dwarf box stood unrivalled "for bordering up a knot, and was esteemed a marvellous fine ornament to the flower garden."

The branches were in request among our ancestors for decking up houses; they are still seen among other evergreens in churches at Christmas, and in some countries they are borne by attendants at funerals.

Box has been much celebrated as a medicine in the venereal disease, colics, intermittent fevers, and even madness. According to Dr. Blaine, it is the principal ingredient in Well's Watford Drink, which is given as a preventive to canine madness.

Pliny affirms, that no animal will touch the seed of box. Gmelin relates, that the branches are fatal to the camels that eat them. None of our animals seem to touch this tree. Corsican honey was supposed by the ancients to owe its infamy to the bees feeding on the box.

CULTURE.—All the varieties of *box* may be propagated by cuttings, planted in autumn in a shady border. The best season for removing the *common box tree* is in October; though if care is used to take them up with a ball of earth, they may be transplanted almost at any time, except the middle of summer.

The *dwarf* or *Dutch box* is commonly used for bordering flower-beds. It is increased by parting the roots, or planting the slips; but as it makes a great increase of itself, and easily parts, it is hardly worth while to plant the slips that have no roots. For borders to flower-plots, it far excels any other plant. It is of long duration; is easily kept handsome; and by the firmness of its rooting, keeps the mould in the borders from washing into the gravel walks more effectually than any plant whatever.

BYSTROPOGON.

Class Didynamia Gymnospermia. Nat. Ord. *Labiata*.

The Characters are—*Calyx with five-subulate teeth, closed at the orifice with hairs; upper lip of corolla bifid, lower trifid; stamens distant.*

many branches. Leaves on long peduncles, hairy, and ash-coloured on their under side. The flowers are produced from the side of the branches on pretty long peduncles, each sustaining four roundish heads, dividing by pairs, and spreading from each other. They come out in June and July, but do not produce ripe seeds in England. The corolla is white. The leaves, when bruised, emit an agreeable odour. The gardeners have given it the title of Madam Maintenon. Native of Madeira Introduced 1775.

CULTURE.—The species of this genus must be preserved in the conservatory. They are all propagated by cuttings during the summer months in a mixture of peat and loam.

BYTTNERIA (in honour of D. S. A. Byttner, professor of botany in the University of Gottingen).

Class Pentandria Monogynia. Nat. Ord. *Byttneriaceæ*.

The Characters are—*Petals 5; nectary five-leaved; filaments inserted into the end of the nectary; capsules of five divisions muricated.*

angular branches, armed with short, reflex, cartilaginous prickles. Leaves pale-green, especially underneath. At the axils of the leaves, stem, and branches, the flowers are produced singly on short peduncles. They are white, with red mucrones; anthers yellow. Native of Guiana; flowering in July. Introduced 1793.

2. **BYTTNERIA PANNOSA** (cloth-leaved Byttneria). Bot. Mag. 2191. *Leaves ovate-lanceolate, unequally serrate-toothed, pubescent above, hairy beneath.*

—A green-house shrub, native of Port Jackson, N. H.; flowering in June and July. Flowers white from tomentum in axillary panicles. Introduced 1800.

CULTURE.—The species of this genus are numerous and of easy culture, thriving well in a mixture of loam and peat. The stove and green-house species are readily increased by cuttings, which root freely in sand under a hand-glass. The others are easily raised from seeds.

END OF VOL. I.

